The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXIV. No. 615 APRIL 11, 1931 Prepaid Annual Subscription: United Kingdom, £1 1.0; Abroad, £1.6.0

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to THE CHEMICAL AGE *is 21s. per annum for the United Kingdom, and 26s. abroad. Cheques, Money Orders, and Postal Orders should be made payable to Benn Brothers, Ltd.*

Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, *have for some years past adopted the five-day week, and the editorial and general offices (Bouverie House, 154, Fleet Street, London, E.C.4), are closed on Saturdays.*

Telegrams: "Allangas, Fleet, London." Telephone: City 0244

United States Chemical Trade

THE American Chemical Society has caused an interesting analysis to be made of the foreign trade of the United States in chemicals, and bases on it the confident opinion that the world-wide depression, the severest test the American chemical industry has experienced since its remarkable rise after the war, proves the immense new growth of the industry to be sound. Basically, it is claimed, conditions are wholly encouraging. Compared with other American industries, chemicals have come through the world crisis well, and now occupy a favourable position for taking advantage of the revival to which the business public are looking forward.

The figures in detail seem to support this favourable view. During the year, while the total imports of all commodities into the United States registered a decrease of 30 per cent. as compared with 1929, those of chemical products fell off only 22·2 per cent. Total exports to foreign countries dropped 27 per cent., and those of chemicals 15·9 per cent. Comparison with other lines of trade shows that American chemical firms have little cause for complaint. Until 1927 the balance of trade in chemicals was consistently against the United States. In three of the last four years, however, exports have exceeded imports in value, and in 1930 the margin was larger than ever before, an indication that the United States is becoming more and more self-sufficient in the chemical industry and is turning out a continually increasing surplus for sale abroad. In 1930 this margin was $15,861,000, and in 1929 $8,047,000. The decrease in chemicals was distributed fairly evenly over the whole field of chemical commodities. There were no precipitous declines in the more important items and no marked gains. Of the greater classes into which chemical products are grouped, only one, the exports of industrial chemical specialities (a group including articles in common use such as baking powder, insecticides, and polishes) showed an actual gain in value. Exports of coal tar products were practically the same as in 1929. Imports of coal-tar medicinals dropped from $332,000 in 1929 to $273,000 in 1930. The decrease in quantity was even more pronounced, the total of 72,000 lbs. being less than one-half the trade of the year before. In the export field the unusually good showing of coal-tar products was due to much heavier shipments of benzene and coal-tar pitch. This trade, going largely to Germany and the United Kingdom, has enjoyed a steady expansion in recent times, and last year's shipments totalled more than twice as much as those of two years before. Exports of coal-tar pitch almost trebled in quantity, amounting to 27,000 tons as against 9,800 tons in 1929.

In industrial chemical specialities, the largest single item in point of both bulk and value is liquid household insecticides and exterminators, of which the United States exported 11,781,000 lbs. in 1930, valued at $3,638,000, a substantial gain over the 1929 trade, which stood at 10,254,000 lbs., valued at $3,054,000. In industrial chemicals the most important single commodity in point of value among the imports continued to be sodium cyanide, the total in 1930 amounting to $2,043,000. In the export trade the leading article is caustic soda, sales of which showed a handsome gain last year. The value rose from $3,516,000 in 1929 to $3,706,000 in 1930. Importations of paints and paint materials were lower all along the line last year. Particularly noticeable was the drop in imports of Chilean nitrates. They totalled only 568,000 tons in 1930, falling off from 930,000 tons in the year before and more than 1,000,000 tons in 1928. Imports in 1930 were the lowest in fifteen years. In explosives, dynamite showed the largest decrease, the 9,090,000 lbs., with a value of $1,280,000, comparing with 16,277,000, valued at $2,228,000, in 1929. Imports of soap and toilet preparations, mostly perfume materials, etc., have been steadily declining for several years. Almost four times as much crude petroleum was sold to Europe as in 1929. Japan also took larger quantities, but the trade with Canada fell off somewhat. Sales of gasoline and other light products to several European countries increased, including Belgium, France, Germany, Spain, and the United Kingdom, while shipments to South America declined.

Leading the Blind

ONE wonders what any reasonably intelligent chemical worker, who may have saved a few pounds and invested it in the Savings Bank, the local Co-operative Society, or other organisation that pays interest on deposits, thinks of the stuff that is being written about chemical profits? Discussing the results of the past year's working of Imperial Chemical Industries, one editorial instructor of the workers refers to "these colossal profits for non-producing stock-holders." If the stock-holders were, indeed, "non-producing," they would, after all, only be in the position of most trade-union officials, who produce nothing that would sustain even an infant. But the stock-holders, far from being "non-producing," have made possible chemical employment for many thousands of workers by producing at the very outset money for works, for expensive plant, for the invention of new chemical processes, for the exploration of home and foreign markets, and for the payment of wages for labour.

And what does the stock-holder get in return out of the "colossal profits." The preference and the ordinary I.C.I. shareholders get respectively 6 and 7 per cent. interest on their money, a fraction more than the thrifty trade unionist gets from his local Co-operative Society on his deposits. Is it suggested that the Co-operator is bleeding labour by taking his 5 per cent. interest on his savings, or is it only sinful in the case of a shareholder in a chemical company to accept a similar return on the savings he has risked in the concern? For the idea that the shareholder is always a bloated millionaire is a mere figment; he is in the majority of cases a very ordinary person who works for his living, and merely desires to get a modest return on any money he has saved.

"The workers," we are told, "foolishly do all the giving, and the shareholders all the taking." What do the workers really give? They give their labour, largely unskilled, and they get their pay. They have no responsibility for the business, they do no research, they patent no inventions, they design no plant, they know nothing of the anxiety and expense of developing new processes or running even a small business. All this expense and responsibility falls on other shoulders. And what of the jolly shareholder who gets "all the taking"? In contrast with the workman, who gets his regular pay, the deferred shareholders in the I.C.I. this year will get nothing, though their money has gone to provide work and wages for the very workers on whose backs they are supposed to be riding. If the making of "these colossal profits" is the easy and brainless business that some chemical workers' organs represent it to be, and if all this wealth is produced "entirely" by the workers, what on earth are their statesmanlike leaders thinking of not to set up an opposition to Billingham and Winnington and Widnes and all the rest, and show the combines how simple it is to run complicated scientific and technical industries, and make "colossal" fortunes for themselves? They know the reason quite well—they have not the remotest notion how to do it. The trade union, confined to its legitimate functions, is recognised as a necessary and valuable part of industrial organisation. Trade union influence is certainly not helped by the circulation in the workshops of the kind of stuff we have referred to.

International Hydrogenation

THE announcement made this week of the organisation of a company to be known as the International Hydrogenation Patents Co., Ltd., is one of first-rate chemical and industrial interest. The organisation represents a fusion of the interests of the Standard I.G. Co., the Royal Dutch-Shell group, and Imperial Chemical Industries in the hydrogenation process for the liquefaction of coal and the refining of oils in all countries of the world outside of the United States and Germany. The seat of the new company will be at Vaduz, Liechtenstein.

In addition, it is stated that there will be organised in the near future an International Hydrogenation Engineering and Chemical Co., having its seat at The Hague, the staff of which will be drawn from the technical staffs of the interested companies and which will be the channel through which all licenses will be made available to all users of the hydrogenation process for the design and operation of plants. The International Hydrogenation Patents and Engineering Companies will have full working arrangements for the exchange of patent rights and experience with corresponding companies in the United States which were organised last year and in which the same groups are also indirectly interested, the U.S. companies being controlled directly by the principal units of the American oil industry. German inventions and experience will be available to the new company through the Standard I.G. Co. representing the original fusion of hydrogenation interests between the I.G. Farbenindustrie and the Standard Oil Co. of New Jersey.

The Calendar

Apr.		
13	Society of Chemical Industry (London Section): "Studies in the Free Air Cooling of Hot Gases in Mains." J. W. Walters. 8 p.m.	Burlington House, Piccadilly, London.
13	Ceramic Society (Pottery Section): 7.30 p.m.	North Staffordshire Technical College, Stoke-on-Trent
14	Society of Chemical Industry (Birmingham and Midland Section): Annual Meeting. "Modern Methods of Sewage Disposal." F. R. O'Shaughnessy. 6.45 p.m.	Chamber of Commerce, New Street, Birmingham.
14	Institute of Petroleum Technologists. 5.30 p.m.	John Street, Adelphi, London.
14 & 15	Electroplaters' and Depositors' Technical Society: "Experiments in Cadmium Plating." S. Wernick. 8.15 p.m.	Northampton Polytechnic Institute, London.
15	Society of Glass Technology. Annual General Meeting. 2 p.m.	Sheffield.
15	Institute of Fuel: Annual General Meeting: "The Smoke Problem." Arnold Marsh. 6 p.m.	Burlington House, Piccadilly, London.
17	Institute of Metals (Sheffield Section): "Extrusion." R. Genders. 7.30 p.m.	University, Sheffield.
17	Physical Society. 5 p.m.	Imperial College of Science, London.
17	Institute of Fuel: "Theory and Practice of the Gasification of Coal in Producers." H. L. Pirie. 7 p.m.	University College, Nottingham.
17	British Association of Chemists and Society of Dyers and Colourists: "Patent Law Relative to the Chemist and Technologist." H. E. Potts.	36, George Street, Manchester.
17 & 18	Faraday Society: General Discussion on Photo-chemical Processes.	University, Liverpool.

The Nitrate Fields of Chile

A Visit to Maria Elena—The New Guggenheim Process at Work

(From Our Special Correspondent)

The extensive trade tour through South America, which Mr. John A. Benn is undertaking on behalf of Benn Brothers, Ltd. included a visit to the Chilean nitrate fields at Maria Elena, of which he contributes an interesting notice, together with a series of photographs taken by himself. This was the first occasion on which the property had been visited by an English newspaper representative.

Tocopilla, Chile.

DRIVING sixty miles through the barren desert that stretches from the coast to the Andes, I visited the nitrate fields at Maria Elena, being the first English journalist to inspect this property, which was opened in 1927. The desert extends for thousands of square miles, and not a trace of vegetation grows in this arid region, where rain is almost unknown. The road from Tocopilla consists for the most part of a track made by the wheels of vehicles, with a sprinkling of tar in the grooves that have been formed in the sandy surface. When I add that our Chilean driver at times exceeded 40 miles an hour and that twice a halt was necessary to allow the engine to cool down, it will be realised that the journey was decidedly an adventure. From the coast the road winds its way through rocky hills, making a steep ascent to the desert plateau where Maria Elena is situated, 4,000 ft. above sea-level.

The first signs of the nitrate fields—the only signs of any habitation at all—are the electric railway that runs to Tocopilla, and the rows of pylons that convey electric power across the desert. The pylons follow the "road" closely, though the railway takes a different direction. I am told that the scenery resembles the "Mud Lands" of Arizona—a sandy, rocky surface stretching as far at the eye can see, the monotony only modified by low ranges of hills.

In the brilliant sunshine the model village built for the American staff made a pleasant change of scene as we reached Maria Elena. There are 400 "foreign" engineers and managers who direct the Chilean workmen, and the camp is furnished with a hospital and a club to provide for the social life of the community. Hard tennis courts were baking in the mid-day heat, but powerful electric lamps arranged round the netting indicated that games are played at night, when the temperature is comparatively cool. Little pots of nasturtiums and other climbing plants are grown in the shade on the verandahs of the houses.

Not far from the village stand the enormous works and chimneys where the chemical treatment of the nitrate ore is carried out. The scene here resembles any big chemical plant in the north of England, except that the desert sky is brilliantly blue in contrast with the smoky atmosphere of our industrial towns.

The nitrate fields at Maria Elena cover fifty square miles

FIG. 1.—A VIEW OF THE WORKS.

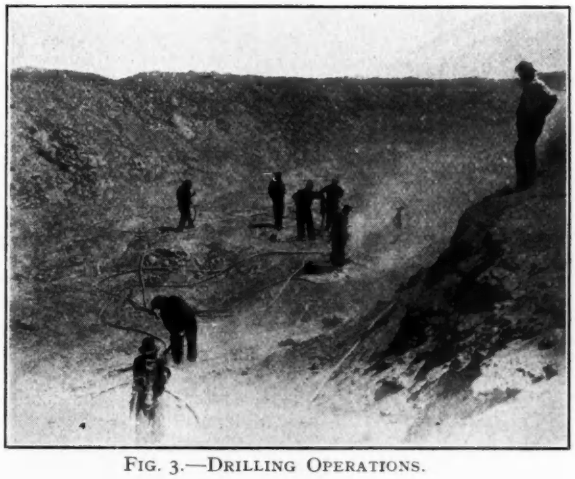


FIG. 3.—DRILLING OPERATIONS.

FIG. 2.—EXCAVATING THE NITRATE.

FIG. 4.—LOADING ORE INTO TRUCKS.

and are operated by the Anglo-Chilean Consolidated Nitrate Corporation. Although the English name is retained, this is now an American enterprise, having been bought by the Guggenheim interests five years ago. The American staff is supported by 4,500 Chilean workmen, and cordial relations have been maintained by reason of the careful labour conditions which the Chilean Government requires. One of the first steps when the industry began to pass into foreign control was the introduction of labour legislation, and in consequence the trouble that has arisen in other South American republics has been avoided in Chile. Work at Maria Elena is conducted in two eight-hours shifts, from 7 a.m. to 3 p.m. and from 3 p.m. to 11 p.m. and as much as

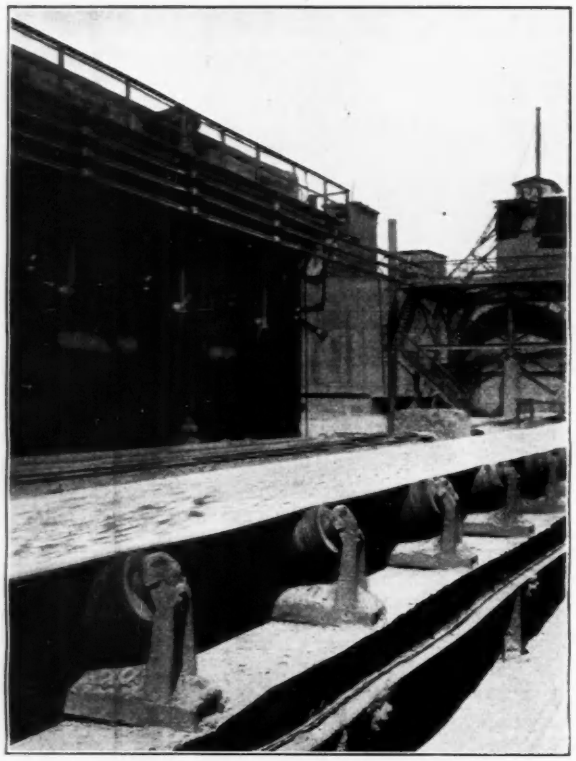


FIG. 5.—MECHANICAL CONVEYOR.

20,000 tons of ore are mined every day. The output of nitrate after the ore has been reduced averages 1,500 tons per day.

The initial operation is to remove the surface dust which covers the ore or *caliche*. Rails are laid across the fields to the areas under treatment and the mining plant is transported by electric locomotives. About twelve areas are usually worked simultaneously, so that the field arrangements might be compared with an octopus—the permanent works being situated at the centre with temporary lines running out in various directions across the surrounding "fields." A particular line may, of course, remain unchanged for several months, but so stable are the weather conditions that the electric pylons are not driven into the ground adjoining the railway—their base is constructed like a toboggan, and when the line is moved each pylon is simply dragged to its new position.

After the line is laid a mechanical shovel is conveyed to the scene of action. Here it is set to clear away the surface to a depth of from 3 to 5 ft., the dust being dumped by the giant bucket into railway trucks. When the ground has been cleared a gang of men proceed to drill the ground, making holes in the ore at intervals of 6 ft. The work resembles the familiar street operations in London, as compressed air drills are used; the chief distinction being the immense clouds of white dust which the drilling causes. The compressed air is conveyed from headquarters through metal pipes, a pressure of 85 lb. being obtained at a distance of five miles from the generating plant. Power is provided by Diesel oil engines; eight units of 5,000 h.p. are installed

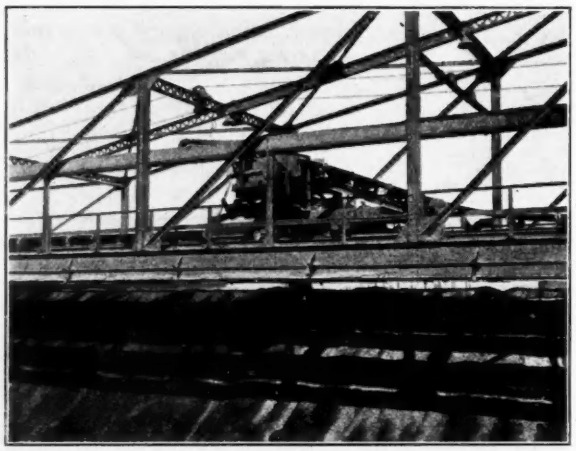


FIG. 6.—DELIVERY OF ORE FROM MOVING BRIDGE INTO TANK.

at Maria Elena, this plant being the largest of its kind in South America. All the water for the works is pumped from the Loa River.

After holes have been drilled over an area sufficient to yield about 4,000 tons of ore, charges of dynamite are inserted and blasting takes place. The next stage is conducted by another mechanical shovel, which loads the ore into trucks for transportation to the works. In a shift of eight hours about 9,500 tons of ore are mined.

Arrived at the chemical plant, the *caliche* goes through the familiar stages of treatment, commencing in the grinding machines. The ore is broken into small pieces the size of lumps of sugar, and travels along a mechanical feeder to the leaching baths. A wide belt several hundred yards in length continually feeds the tanks, each 40 ft. high with a capacity of 7,500 tons. A moving bridge ensures even distribution of the ore in each tank. When the mother liquor has been obtained by soaking the powdered ore, it

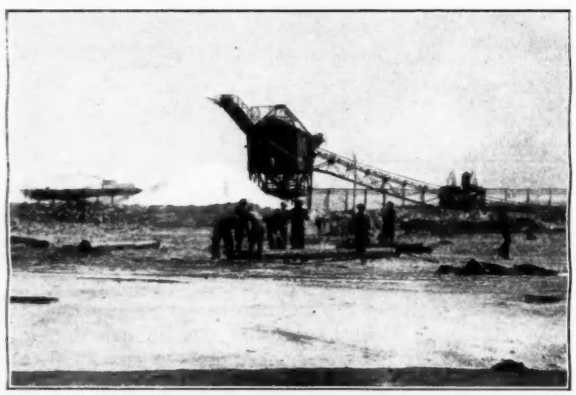


FIG. 7.—A SCENE ON THE WORKS.

is passed through pipes to adjoining buildings for purification. This process is carried out in several stages, and eventually the liquor is crystalised, having been sprayed through fine nozzles to assist cooling.

By the time this last stage had been inspected, I felt somewhat overcome by the heat of the many buildings through which we had passed. The fierce heat of the sun

was cool beside the temperature in the power house, which approached 122° F. It was therefore a relief to see the brilliant white salt being packed in bags, ready for the market. In the yard by the crystallising plant a large pile of salt formed a striking contrast with the dark skins of the Chilean workmen, who seemed quite surprised when I photographed the scene for THE CHEMICAL AGE.

It is only in the past five years that mechanical mining has been introduced in the Chilean nitrate fields. All the digging and shovelling was previously done by hand, and the resulting costs were comparatively high. This was of minor importance before the introduction of synthetic processes in Europe and the United States, which have had a drastic effect on the industry in Chile. Of more than 100 fields actively worked at the end of the war, only ten are now in operation.

The situation became so drastic in 1927 that the Government instituted a Department of Mines to co-ordinate the smaller plants. This step was followed last year by a project to bring all the plants in the country under joint control, and a national company will be formed with the title "Compañia Salitrera de Chile." Production and sales will be centrally organised, and it is expected that the nitrate fields will take a new lease of life as a result of this enterprise. The position has been further improved through the agreement recently concluded with the synthetic producers abroad to ensure that markets are shared.

Meanwhile, the Anglo-Chilean company is applying the Guggenheim process to replace the Shanks process hitherto employed, and it is expected that this will further assist the prosperity of the industry. I saw several of the new processes at work and obtained a most favourable impression of the efficiency that characterises the Chilian nitrate fields at the present time. How long the natural product will be able to compete with the Eruopean plants remains to be seen, but there is no doubt that every effort will be made by the Chilean producers to maintain their position in the world's markets.

Institution of Chemical Engineers

Recent Elections to Membership

THE following elections to various grades of membership are announced in the April Bulletin of the Institution of Chemical Engineers :—

Members.—Richard Charles Bowden, M.Sc., Ph.D., F.I.C., Directorate of Ordnance Factories, War Office; William Aethelbert Damon, B.Sc., F.I.C., Chief Inspector of Alkali Works, Ministry of Health; Donald McDonald, B.Sc., F.I.C., Johnson Matthey and Co., Ltd., London; Percy Marland, Midland Tar Distillers, Milton, Stoke-on-Trent; Lancelot Arthur Mitchell, A.M.I.Mech.E., Consulting Chemical Engineer, Manchester; Louis Frederic Mountfort, A.M.Inst.C.E., A.M.I.Mech.E., Sewage Disposal Works, Edmonton; Thomas Alfred Smith, B.Sc., F.I.C., Directorate of Ordnance Factories, War Office.

Associate Members.—Herbert Donald Greenwood, M.Sc., A.I.C., South Metropolitan Gas Co.; George Lewis Kennaby, B.Sc., Anglo-Persian Oil Co., Masjid-i-Sulaiman; Harold Livesey, British Celanese, Ltd., Spondon (transfer from graduate); Thomas Harold Prater, Isle of Thanet Gas Co., Margate (transfer from graduate); Basil Aykroyd Smith, Preston Street Combing Co., Ltd., Bradford.

Graduates.—Alexander George Grant, M.Sc., Whessoe Foundry and Engineering Co., Darlington; Philip Powell Grigg, B.A., University College, London; Rohidas Raghavendra Hattiangadi, B.A., M.Sc., Imperial College of Science and Technology; Harold Lewis, B.Sc., A.I.C., Canadian International Paper Co., Hawkesbury, Ontario; John Parry, British Dyestuffs Corporation, Manchester.

Students.—Robert Brackenbury Budgett, B.A., Imperial College of Science and Technology; Shuldham Archibald Burke, Imperial College of Science and Technology; Israel Harris Chayen, B.Sc., A.R.C.S., Imperial College of Science and Technology; Edward Bryan Lloyd Colborne, B.Sc., A.R.C.S., Imperial College of Science and Technology; Arnold Dudley Johnston Piesse, Imperial College of Science and Technology; Stanley Credland Porter, Ipswich Gas Light Co.

Society of Public Analysts

Experiments on Hardness of Fats

AN ordinary meeting of the Society was held at the Chemical Society's Rooms, Burlington House, on Wednesday, April 1, the President (Dr. J. T. Dunn) being in the chair.

Certificates were read for the first time in favour of George Brown, A.I.C., Charles Louden, B.Sc., A.I.C., Charles Percy Money, B.Sc., F.I.C., Martin Priest, F.I.C., Arthur Goodyear Simpson, M.A., Gerrish Smith; and for the second time in favour of K. N. Bagchi, B.Sc., M.B., D.T.M., William Nelson Bradshaw, B.Sc., Adrian Joseph Clifford Lickorish, F.I.C., Ernest Grenville Purser, B.Sc., A.I.C., and William Waddell Robson.

The following were elected Members: Cecil Chilvers, B.Sc., F.I.C., Jack Hubert Hamence, M.Sc., A.I.C., Cecil John House, B.Sc., A.R.C.Sc., F.I.C., and Henry George Rees, B.Sc., A.R.C.Sc., A.I.C.

Abstracts of Papers

In a paper on "Carbon monoxide poisoning: its detection and the determination of the percentage saturation in blood, by means of the Hartridge Reversion Spectroscope," by R. C. Frederick, A.I.C, the use of the Hartridge reversion spectroscope and of various accessories to facilitate the the accuracy of reading was described. The instrument was shown to be capable of giving a quantitative determination of very small percentages of carbon dioxide in a minute quantity of blood. The author had been unable to confirm Haldane's conclusions on nitrogen monoxide hæmoglobin, the reversion spectroscope showing that the nitrogen monoxide hæmoglobin spectrum was quite different from that of carbon monoxide hæmoglobin.

Experiments on the hardness of fats were described by H. M. Mason, M.Sc., F.I.C., and G. Walsh, B.Sc., A.I.C. A simple apparatus had been devised in which the weight required to drive a plunger into the solid cake of fat of standard thickness under standard conditions was measured. Graphs were given showing the relation between three types of plunger —large, medium and small—and relationships had been established between the degree of pressure and the structure of the fat. The results of the hardness test had also been used to establish the identity of fats and to detect adulteration. Tables and curves showing the results obtained with various fats and mixtures were given.

A new process for the determination of small amounts of bromide in chloride was described by B. S. Evans, M.C., Ph.D., F.I.C. Bromides are rapidly and completely oxidised by chromic acid in the presence of sulphuric acid preferably of 8*N* to 9*N* strength, whilst chlorides remain untouched. The liberated bromine is conveyed by means of a current of air into an absorption flask containing standard arsenious oxide solution and some sodium bicarbonate, and the excess of arsenious acid is titrated with standard iodine. For determining small percentages of bromides in chlorides the bromine is first absorbed in a tube containing 0·5 per cent. sodium hydroxide solution, and this solution is then treated with one or two drops of saturated sulphur dioxide solution, then with dilute sulphuric acid and chromic acid, and the determination completed as described.

S. G. Walton and R. G. O'Brien dealt with the use of bromine as a reagent in the determination of alkaloids. The thalleioquin reaction for quinine has been made quantitative, the excess of bromine being removed by aeration, and the coloration compared with that given by standard solutions. An iodimetric development of the method enables quinine to be determined in the presence of other alkaloids. The bromine compounds of morphine and most of the other opium alkaloids liberate iodine from potassium iodide, and methods of determination are based on the reactions. Codeine may be determined colorimetrically by measuring the depth of the red colour formed on oxidising its bromine compound with hydrogen peroxide. Colorimetric methods have also been devised for the ipecacuanha alkaloids, based on the yellow coloration formed on aerating the bromine compounds.

Aji-no-moto

By G. Malcolm Dyson, Ph.D., A.I.C.

A recent editorial note in THE CHEMICAL AGE *on "Aji-no-moto" has attracted some interest, and elicited an article on the subject from Dr. Malcolm Dyson and a letter from Mr. S. T. T. Geary, of Birmingham.*

A RECENT editorial article in this journal has drawn attention to "aji-no-moto" and as it has been the writer's privilege to have had a somewhat intimate connection with this preparation, some details concerning it may be of interest to the readers of THE CHEMICAL AGE. Aji-no-moto is by no means a new preparation, and was prepared by non-chemical means long before the growth of the chemical industry in Japan. The present writer analysed a sample in 1920, and was able to compare it with a sample which had been previously imported into this country in 1910.

The preparation known as aji-no-moto (or "ve-tze-sin," "Gluta," "Aji" or "Chuyu" in the Chinese market) is an impure form of the sodium salt of glutamic acid. Their entry as such into Oriental diet is mainly due to the work of Kikunae Ikeda, who had observed that the seaweed *Laminaria japonica* had been used for some considerable time for the sake of its meat-like flavour in Japanese cookery, and determined to investigate the plant to ascertain the exact nature of the ingredient to which it owed this property. His researches (1) showed that the monovalent glutamic ion obtained when monosodium glutamate is dissolved in water, exhibits a very strong meat-like taste. This meat-like flavour is shewn at the very considerable dilution of 1 part in 3,000. When it is recalled that the threshold value for the sweet taste of cane sugar is about 1 in 300, it will readily be realised that the meat taste of sodium glutamate is very pronounced. This meat taste is put to good use in the preparation of various dishes such as rice and similar cereals, to the flavour of which, variety is given by the addition of sodium glutamate. The Japanese were, at one time, accustomed to add a little dried fish to accomplish the same purpose, and it has been shewn that the fish favoured for this purpose contain, in the dried state, a considerable amount of glutamic acid. One of the contributory factors which has added to the scope of the use of this condiment is the fact that the Buddhists condemn a meat diet, but when sodium glutamate is prepared from vegetable sources it forms a welcome addition to the diet. This may seem to us just one more example of confusion between "the shadow" and "the substance," but one has only to remind the reader of the enormous quantities of so-called "soup powders" that are sold in this country, to convince him of the fact that we only differ in degree. In fact, there is one well known brand of meat preparation that contains sodium glutamate on the market in this country. The use of aji-no-moto has been introduced into France and America, and is slowly gaining in favour. The cost ranges from 10s. to 15s. per lb., but the quantity consumed is so small that this only represents a very small weekly expenditure.

There are other products which contain glutamic acid. It was shewn by Monti (2) that it was possible to get as much as 1·5 gm. of the sodium salt of glutamic acid from 1 kg. of tomato sauce, and the present writer (3) was able to isolate glutamic acid from the shoyu, or matured soy-bean sauce of the East. It appears that the enzymes involved in the fermentation of the soya-beans are able to split up the protein substance edestin which they contain. Edestin consists very largely of glutamic acid molecules joined together, and the appearance of glutamic acid as one of the main products of its hydrolysis is only to be expected.

Methods of Manufacture

There are three main raw materials for the manufacture of aji-no-moto, which name, in English, means, "the element of taste." The original process of Ikeda involved the use of seaweed, but has been discarded in favour of the methods which use either soya-beans, fish protein or wheat gluten as the raw materials. The manufacture from fish protein was introduced by Yamamoto in 1917, and involved the hydrolysis of the fish protein with acid while a separate portion was hydrolysed by alkali. The two portions were united after hydrolysis and gave a product which was stated to contain esters of glutamic acid of superior flavour to that of the acid itself.

The original patent of Ikeda and Suzuki for the production of the monosodium salt of glutamic acid from various proteins cited gluten and soya-bean meal as the best protein materials, and hydrochloric or sulphuric acid as the proposed acids. Later, (4) Takayama described a method by which the glutamic acid could be separated as the dibasic calcium salt from the liquid obtained when crude soya-bean protein is heated with 50 per cent. sulphuric acid. The calcium salt could then be converted into the sodium salt by the usual processes. The process is beginning to find favour as a commercial method on account of the shortage of wheat gluten in China. China is one of the largest markets for the sale of aji-no-moto, but Chinese wheat suffers from the disadvantage that the kernel contains only a very small proportion of gluten; further, the demand for starch in these countries is not very large, so that the working up of imported wheat for these products is not in itself a profitable proposition. It may be mentioned in passing that the total value of imported and home manufactured aji-no-moto used in China in 1928 was valued at a little less than a quarter of a million sterling. It appears that an export trade could be built up, using the wheat kernels obtained in British milling as a raw material.

The Chinese method of manufacture is to use the coarsely ground wheat kernels from which oil and starch have been extracted—crude gluten, in fact—and to mix these with concentrated hydrochloric acid in large earthenware pots, each fitted with a reflux condenser. The mixture is heated by hot oil circulating round the pots and the heating is carefully controlled until the raw material has gone into solution, after which it is raised and the acid kept boiling until the protein is completely hydrolysed. This can be ascertained by withdrawing samples from time to time and applying the biuret test. The absence of a violet colour indicates that hydrolysis is complete. The cooled liquid deposits crystals of glutamic acid hydrochloride. These may be washed, and treated with a sufficient amount of sodium hydroxide solution to convert them into the monosodium salt. The great difficulty in the aji-no-moto industry, especially where the preparation from gluten is attempted, is to purify the product, which contains dark coloured impurities, and usually traces of arsenic, and products derived from defects in the glaze of inferior chemical stoneware, in which the hydrolysis is carried out. The modern process of Woo (or Wu), the works manager of the Tien-Chu aji-no-moto factory, is now almost exclusively employed. His process (5) involves the use of a small quantity of tin, which appears to act as a catalyst in the hydrolysis of gluten. His temperature requirements are somewhat exacting, as he uses the lowest temperature which avoids coagulation of the protein, but the short duration of the hydrolysis leads to an increased yield of the glutamic acid, and less destruction of the desired product. The tin also rids the solution of any traces of arsenic that may be present. The substance is isolated by the addition of alcohol, and the product is whiter and purer than that prepared by the earlier processes. The product contains up to 90 per cent. of the mono-sodium glutamate, the residue being mainly sodium chloride. Fong (6) has also contributed to the economic production of sodium glutamate. His process consists in the pre-treatment of the gluten with alkali, together with the use of an oxidising catalyst such as manganese dioxide during hydrolysis.

Various other methods have been introduced for the purification of the crude glutamic acid salt, including the electrolysis of solutions which contain it; the glutamic acid collects in the anode compartment while amphoteric amino acids are not drawn to either anode or cathode. Definitely basic amino-acids collect in the cathode chamber.

(1) Ikeda. Original Communication to 8th Inter. Congr. Appl. Chem. **18**, 147.

(2) Monti, *Staz. sperimentale agrar. Ital.* **44**, 813.

(3) Dyson, *Pharm. J.* **1928**, 375.

(4) Takayama, *J. Soc. Chem. Ind. Japan.* **33**, 91 (1930).

(5) Woo, British Patent 258655, Sept. 24, 1926.

(6) Fong, French Patent 659815, Feb. 18, 1929.

Aji-no-moto from Sugar Residues

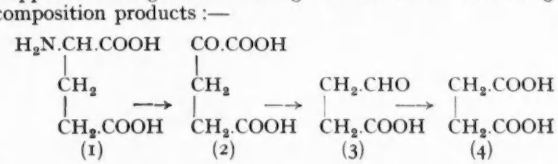
Glutamic acid may be recovered from the residue left after sugar has been obtained from beet juice, known as "schlempe," or from the extract made from molasses. Andrlik (7) described such a process in 1916, although the Melasseschlempe G.m.b.H had previously patented a process in 1912 (8). Reference has already been made to the process of Takayama (9) in which the electrolytic method is made use of to separate glutamic acid; this process was originally applied to schlempe. The Larrowe Construction Co. have patented a method for the extraction of glutamic acid from beet residues (10) by heating with hydrochloric acid after the separation of betaine hydrochloride, followed by cooling, when the glutamic acid hydrochloride separates out; an almost indistinguishable process has also been patented in Canada by Tressler (11). An interesting modification of the process was introduced, again by Takamaya (12), who ferments the sugar residues, distils out the alcohol, and dialyses the residue. The liquor passing through the membrane is treated with a mineral acid, after concentration, when potassium salts and betaine salts separate. On heating the filtrate glutamic acid is formed and crystallises out as the hydrochloride on cooling.

A description of the process of Ikeda, which is the most used of these processes (13), is given below. The schlempe, if of the usual syrupy consistency is first diluted, then heated with sulphuric or hydrochloric acid in order to hydrolyse the glutamine and like compounds and to liberate glutamic acid. The acid gives rise to humus-like substances which are filtered off, and the liquor is then neutralised with lime.

When sulphuric acid has been used as the hydrolytic agent the calcium sulphate is filtered off and the liquor decolourised by animal charcoal. The clear liquor is then digested with excess of lime, filtered while still warm and evaporated to a small bulk, which process may most advantageously be carried out under reduced pressure. On standing, the acid calcium salt containing one molecule of water of crystallisation separates out. This is allowed to separate out for two days, after which it may be filtered off and washed with water. This operation involves no material loss owing to the very small solubility of the calcium salt in cold water.

Hydrochloric acid may also be used for the preparation of the liquor for precipitation. For instance, 10 kg. of schlempe (density 1·4) and 6 litres of hydrochloric acid (density 1·18) are heated for several hours at 130° C. The filtrate from the hydrolysed solution is evaporated until the density is between 1·30 and 1·35, and the addition of hydrochloric acid is continued until the solution is saturated with it. A mass of crystals of glutamic acid hydrochloride separate in the course of a few days, and may be converted to the calcium salt in the usual way.

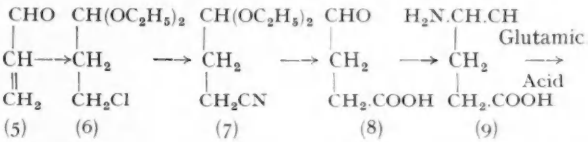
Miller and Robinson,(14) were able to isolate glutamic acid in fair quantity by the application of Foreman's method to the liquid obtained by the hydrolysis of peat; aspartic acid was also produced. Glutamic acid also turns up most unexpectedly in various fermentation operations. Thus, it is supposed that glutamic acid gives rise to the following decomposition products :—



from which it appears that glutamic acid (1) is responsible for the formation of succinic acid in the (4) fermentation of cereal washes. It is interesting to note that the intermediate product, α-ketoglutaric acid (2), is postulated by Knoop and Oesterlin (16) as the precursor of glutamic acid in its natural synthesis. Details for the preparation of pure glutamic acid in 80 per cent. yield, on a laboratory scale, are given by Lewis, Chiles and Cox (17), and a detailed account of its biochemical significance is given in the Handbuch der Biologischen Arbeitsmethoden (18). Schmidt and Foster (19) also give a very convenient method by which pure glutamic acid for experimental purposes can be obtained from the commercial aji-no-moto. There is, apparently, not the slightest danger attached to the use of aji-no-moto as a foodstuff; it is one of the breakdown products of ordinary protein digestion in the alimentary tract, and is therefore a normal constituent of the digested food juices; moreover, the work of Wilson and Lewis appears to show that it stimulates the deposition of glycogen in the liver, although not so strongly as does alanine (20).

Synthetic Glutamic Acid

The rapid and easy preparation of glutamic acid from natural sources does not make the synthetic preparation of the acid appear as a very profitable commercial enterprise. Nevertheless, it has been accomplished on a large scale by Keimatsu and Sugasawa (21). The starting point is acrolein,



which when treated with alcoholic hydrogen chloride yields β-chloropropionacetal (6), convertible to β-aldehydopropionic acid (8) by treatment with an alkali cyanide and subsequent hydrolysis. Further treatment with ammonia and a cyanide yield the compound (9) which on hydrolysis gives glutamic acid. It may be added that at the present time there is no probability of this synthesis displacing the preparation of glutamic acid from natural sources.

Such then, is the chemistry of aji-no-moto; Mr. Punch may laugh at us; in fact, there is no doubt that he does do so, for a jibe at chemical terminology is one of his invariable resources when material for Charivaria is running short; however, we bear no malice and laugh with him, content with the thought that our craft is the basis of his existence.

Commercial Production as By-Product

[*To the Editor of* THE CHEMICAL AGE.]

SIR,—Your leading article on "Aji-no-moto," which appeared in your issue of March 28, recalls to my mind efforts which were made in 1926 to obtain knowledge of any British firms manufacturing fine chemicals who might have been in a position to supply sodium glutamate in response to a then demand for this substance.

The intense flavouring powers of this product are truly remarkable—one part of which dissolved in 3,000 parts of water is just perceptible to taste, and which, compared with sugar and salt, is 15 times and 7 times respectively as strong.

So far as I can say at the moment, the only supply of aji-no-moto is from Japan, which renders the cost for use as a flavouring medium prohibitive.

The origin of the industrial preparation in Japan is believed to be beet residues, and with the present developing state of beet sugar manufacture in this country, one is prompted to ask whether the commercial production of aji-no-moto would prove a tempting line of investigation as a by-product in this country.—Yours, etc.,

S. T. T. GEARY.

61, Featherstone Road, Kings Heath, Birmingham.
March 31, 1931.

(7) Andrlik, *Zeitschrift Zuckerind Böhmen.*
(8) Melasseschlempe g.m.b.H. German Patent 280824, Dec. 18, 1912.
(9) Takayama, British Patent 233196, July 5, 1924.
(10) Larrowe Construction Company, British Patent 265831, May 17, 1926.
(11) Tressler, Canadian Patent 268728, March 1, 1927.
(12) Takayama, U.S. Patent 1681379, Aug. 21, 1928.
(13) Ikeda, British Patent, 248453, Mar. 3, 1926.
(14) Miller and Robinson, *Soil Science*, **11**, 457, (1921).
(15) Kostychev and Frey, *Z. Physiol. Chem.* **148**, 276 (1925).
(16) Knoop and Oesterlin, *Ibid.* **148**, 294 (1925).
(17) Lewis, Chiles and Cox, *Organic Synthesis*, **5**, 63 (1925).
(18) Abderhalden, *Handbuch der biologischen Arbeitsmethoden* Wertheimer, *Darstellung einer Glutaminsaure*, p. 779
(19) Schmidt and Foster, *Proc. Soc. Exptl. Biol. Med.*, **18**, 205 (1921).
(20) Wilson and Lewis, *J. Biol. Chem.*, **85**, 559 (1930).
(21) Keimatsu and Sugusawa, *J. Pharm. Soc. Japan*, **531**, 369 (1925).

Safety in the Chemical Industry

THE Association of British Chemical Manufacturers and the Chemical and Allied Employers' Federation has decided to organise a Chemical Session in connection with the Safety Week of the National Safety First Association, which is to be held in Leeds from May 11–16. Tuesday morning, May 12, will be devoted to this Chemical Session which will be open to all members of the chemical and allied industries, and to representatives of firms which are members of the National Safety First Association. The chair will be taken by Dr. E. F. Armstrong, Chairman of the Association of British Chemical Manufacturers and of it's Works Technical Committee, who will draw attention to the work on which the Association is now so active in regard to safety in the chemical industry, and to the model safety rules, safety circulars and safety summaries which are now a regular feature of the Association's activities. A subject of wide interest has been chosen for the paper to be presented by Mr. J. Davidson Pratt, General Manager of the A.B.C.M., namely, the cleaning and repair of vessels containing dangerous materials. Special attention will be given to the methods of cleaning and repairing plant and vessels where it is necessary for workmen to enter a confined space in order to perform the allotted task, as these are the conditions under which accidents are most liable to occur.

Chemical Workers on Prize Essay Tour

THREE members of British chemical staffs are among the 20 successful candidates in a prize essay competition organised by the Economic League in conjunction with several prominent business firms to provide British workers with an opportunity of studying industrial conditions on the continent at first hand. They are: Mr. John Sottridge Kingdon, an analyst in the employ of the Synthetic Ammonia and Nitrates, Ltd., Mr. John Brown, a draughtsman, in the employ of the same company, and Mr. Harold Shaw, a chemist dealing with fuel technology, in the employ of Kopper's Coke Oven Co., Ltd. There were 548 competitors, representative of 20 different industries.

The three workers named will join the other successful candidates on Sunday, April 19, in London. After visiting a number of the leading London establishments, including those of the Auto-Strop Safety Razor Co. (now Gillette Industries), Benn Brothers, Ltd., Hovis, Ltd., and Crosse and Blackwell, Ltd., who are bearing the entire cost of the tour, the party will leave by the night boat on Tuesday, April 22, for Antwerp. Subsequently they will visit workshops, factories, and industrial training schools in Antwerp, Liege, Dusseldorf, Essen, Cologne, and Lille, arriving back in London on Wednesday, April 29.

Canadian Chemical Association

AT a recent meeting in Ottawa, thirty-five of the leading Canadian chemical industrialists agreed to merge the existing chemical societies and form a Canadian Chemical Association to cover the whole of the Dominion. The association announces that it will be mainly concerned with the development of chemical industries, scientific technical education and research. Mr. J. R. Donald, a well-known chemical engineer and managing director of J. T. Donald and Co., of Montreal and Toronto, has been elected first president with Mr. J. H. Wilson, of Toronto, as secretary. Mr. Donald has done considerable research on foodstuffs, and is noted in Canada for the investigation of the manufacture of carbon dioxide and "dry ice."

Silicate Cements for Acid-Proof Tanks

QUICK setting silicate of soda cements and their application to acid-proof tank and tower construction was the subject of a paper by F. D. Snell and H. Farkas, presented at a recent meeting of the American Chemical Society. Silicate of soda cements for acid tank and tower construction are of three types: (a) a mixture of inert material with sodium silicate, which hardens by slow drying; (b) a mixture of inert and acid material with sodium silicate, which hardens by drying and by reaction to liberate silicic acid; and (c) a mixture of inert and alkaline or neutral material with sodium silicate, which by reaction will produce an insoluble silicate to give "set" preliminary to drying.

Chemical Matters in Parliament

Iraq Petroleum Fields

In the House of Commons on April 1, Lieut.-Commander Kenworthy asked the Under-Secretary of State for the Colonies (Dr. Shiels) whether the queston of constructing oil pipe lines from the Iraq petroleum fields to the Mediterranean has now been settled; what route will the pipe lines follow; and which port or ports will be used for the seaward end? In reply, Dr. Shiels stated that details of the new agreement signed on March 24, between the Iraq Government and the Iraq Petroleum Company had not yet been communicated to him, but he understood that it contemplates the construction of two pipe line systems from a point of bifurcation in Iraq, one terminating in the Bay of Acre and the other in the vicinity of Tripoli.

Third International Coal Conference

IMPORTANT delegations of fuel technologists from the principal European countries will attend the third international conference on bituminous coal at the Carnegie Institute of Technology Pittsburgh, United States, on November 16 to 21, according to Dr. Thomas S. Baker, president of the Institute of Technology and organizer of the congresses. Conferences with scientists in the coal centres of Europe during a two months' visit assured Dr. Baker of the interest and co-operation of fuel technologists on the Continent. The success of the two previous meetings held in Pittsburgh have demonstrated the importance of the conferences as occasions where scientists throughout the world may explain and discuss their discoveries.

The programme of the third meeting, embracing the more important topics in fuel technology now being considered throughout the world, is progressing rapidly. Since Dr. Baker's return from Europe he has devoted his time to arranging the American programme as well as to corresponding with scientists in Europe. In America great progress has been made in research since the last conference in 1928, and the programme this year will contain announcements of significant developments made in research laboratories in the United States. Special efforts are being made by the committee in charge to arrange inspection visits to the important research laboratories and industrial plants in Pittsburgh and other parts of the country in connection with the conference. Fuel technologists who wish to contribute papers to the conference are advised to apply to the secretary as soon as possible as the programme is rapidly being compiled.

Mineral Production in Canada, 1930

THE High Commissioner for Canada, in London, has received from the Dominion Bureau of Statistics at Ottawa its Preliminary Report on the Mineral Production of Canada during the calendar year 1930, indicating a decrease of 10·4 per cent. in value as compared with the 1929 record of $310,850,246. Production in 1930 was valued at $278,470,563, which is $3,481,076 in excess of the output in 1928. More copper, zinc, natural gas and petroleum were produced than ever before, the lead output exceeded that of the previous year, but the production of coal, asbestos, gypsum, salt, clay products, cement and lime were all lower than in 1929. Lead, tin, and zinc products in 1929 reached a total value of $6,466,168. This is a record for the industry concerned, being 18 per cent. in excess of that for 1928 and 41 per cent. over that recorded for 1920. This report can be consulted at Canada House, Trafalgar Square, London, S.W.1.

Dextrine Factory for the Free State

IT is stated in Dublin that the proposed factory for the production of dextrine, farina and other potato-flour products by Irish Agricultural Industries, Ltd., will be put into operation in the near future. The factory is being established in Athlone on the banks of the River Shannon, and according to the reports about 240 men will be employed, working in three eight-hour shifts. The estimated amount of potatoes which the factory will require is 250 tons per day. There are two Belgian and two French directors, and the fifth is a general merchant in Athlone. There appears to be room for such a factory in the Irish Free State, as the Government impose a tax of £5 per ton on all potato products imported.

From Week to Week

A LARGE benzine tank exploded on April 8 at premises owned by the Irish Food Products, Ltd., of Newforge, near Belfast. One man was killed.

BRISTOL CHAMBER OF COMMERCE is considering the feasibility of organising a collective exhibit of Bristol manufactures and products at the British Industries Fair, Birmingham, in 1932.

SIR FRANK SMITH, K.C.B., C.B.E., D.Sc. (Oxon), LL.D. (Birmingham), F.R.S., Secretary to the Advisory Council, Department of Scientific and Industrial Research, and Secretary of the Royal Society, has received the honorary degree of LL.D., of the University of Aberdeen.

ACCORDING to information received from the United States Assistant Trade Commissioner in Buenos Aires, the Goodlass Wall Co., Ltd., and the Associated Lead Co., which recently merged with a capital of £3,250,000, are reported to be planning the erecting of a paint and varnish factory near Buenos Aires.

IN an article on the trade of Switzerland during 1930, *The Board of Trade Journal* states that the world ecomic crisis has left its mark particularly on Swiss export industries. While most chemical exports show a decrease in value compared with 1929, however, there is generally a marked increase over the 1928 value.

THE RUMANIAN PAINT TRADE estimates that nearly £500,000 worth of varnishes, lacquers and enamels are consumed annually in that country. Of the total estimated consumption, sales of varnishes lead with a value of about £250,000, lacquer sales amounted to £156,000, and enamels and special paints accounted for £94,000.

AMERICAN chemical production, valued at over £500,000 a year, is estimated to be equivalent to 43 per cent. of the world output, compared with 34 per cent. in 1913. During the same period Germany's share of world production has declined from 24 to 16 per cent., Great Britain's from 11 to 9·5 per cent., and that of France from 8·5 to 6·8 per cent.

INFORMATION has been received from the Colonial Office to the effect that a Bill will be introduced, at the next meeting of the Legislative Council of Zanzibar, to provide for the continuance for a further period of one year of the present system of granting a drawback in respect of duty on cloves, which are exported from Zanzibar by the authorised agent of an approved vanillin manufacturer, or of an approved clove oil distiller.

THE GOVERNMENT OF MAURITIUS are prepared to consider applications for a concession for the manufacture of shark products in the Colony for a period of years. The terms of the concession would be arranged with the selected applicant, but would include a condition that the concessionaire will purchase all sharks brought to him at a scale of prices to be fixed. Applications should be made to the Colonial Secretary Port Louis, Mauritius.

PROFESSOR ALEXIS SAPOJNIKOFF, best recalled as director of the Chemical Laboratory at the Engineer Institute for Roads and Communications in Soviet Russia, has been arrested in Leningrad and deported to Siberia. No statement is available concerning the charges which have been made against him. Professor Sapojnikoff was an expert upon explosives, and his co-scientists have always regarded him as "the father of the theory of the nitration of cellulose."

A CIRCULAR issued by Thos. Firth and Sons, of Sheffield, states that the board of Thos. Firth and John Brown, Ltd., will now consist of the following members:—Hon. Henry D. McLaren, C.B.E. (chairman); Mr. F. C. Fairholme and Mr. A. J. Grant (joint managing directors); Rt. Hon. Lord Aberconway, P.C., Sir Charles E. Ellis, G.B.E., K.C.B., Mr. Edward Dixon, O.B.E., Mr. Percy W. Fawcett, O.B.E., Mr. E. Willoughby Firth, Mr. John C. Firth, and Mr. Charles F. Spencer.

"IODINE" is the subject of *Information Circular* 6,387, just issued by the United States Bureau of Mines, from which it appears that Chile still contributes 90 per cent. of the total world production. The remaining 10 per cent. is derived from kelp which is produced along the coasts of Scotland, Ireland, France, Japan and Norway, and from Italy where iodine is recovered from the mother liquors of the salso-bromo-iodic mineral waters. It is reported that the average annual world production of iodine does not exceed 1,000 tons.

THE British Columbia Government is considering a proposal to reduce the tax of 10 cents per ton now levied on phosphate mined within the province.

IN ACCORDANCE with a Senate resolution of February 30, the United States Tariff Commission proposes to hold an enquiry under the Tariff Act of 1930 with respect to import duty in relation to the cost of production of non-edible gelatine and glue.

SALES of the German potash syndicate during March totalled 179,100 tons, as against 187,600 in March of last year. During the first eleven months of the current fertiliser year, total sales were 1,150,000 tons, or 170,000 tons less than in the corresponding period of the previous year.

A MEMORANDUM containing hints for the guidance of commercial visitors to Iraq has been prepared from information furnished by H.M. Consul at Basra. Firms interested may obtain copies on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1 (Ref. C. 3491).

DURING the post-war period Germany has recaptured from the United States its position as leading world producer of natural barytes. Present production is estimated at 300,000 metric tons, as compared with 320,000 tons in 1913. Over 60 per cent. of the domestic output is taken for the manufacture of lithopone.

ON the occasion of the forthcoming meeting of the Society of Glass Technology to be held in Sheffield, April 15, by the courtesy of Dr. W. H. Hadfield, members will have an opportunity of visiting the Brown-Firth Research Laboratories. The inspection of these laboratories will be followed by a visit to the works of Thomas Firth and Sons, Ltd.

A NEW patent has been taken out in Norway for the purpose of producing pure fatty and rosin acids from the sulphate and soda pulp liquors of the paper mills. Hitherto there has been no process available which would eliminate the offensive odour and impurities which are present. It is understood that the new patent solves the problem in a satisfactory manner.

THE British Sugar Beet Society, at its forthcoming annual meeting on April 23, will have before it a report recording the increased growth of sugar beet, and an equally important advance in the output of sugar. The quantity of sugar produced in the 1929–30 campaign was 290,000 tons; owing to the increased area under cultivation the output in the 1930–31 campaign has been increased to 420,000 tons.

THE formation of the Lancashire Industrial Development Council has now been formally confirmed. This Council is to have as its chief aims and objects the encouragement of new industrial enterprise in Lancashire (including the adjacent and overlapping industrial area of Cheshire), and the offering of assistance to those industries which are already established. Its formation has been brought about chiefly by the untiring efforts of the Manchester Chamber of Commerce. The provisional committee consists of representatives from the Chambers of Commerce of Birkenhead, Blackburn, Bolton, Burnley, Bury, Liverpool, Manchester, Oldham, Preston, Runcorn, Stockport, Warrington, Widnes, and Wigan.

Obituary

MR. HERBERT WILLIAM ROBINSON, chairman of the Midland Tar Distilleries and Robinson Bros., Ltd., of West Bromwich and Birmingham.

MR. FREDERICK REVERDIN, a pioneer in dye research and the author of many books and articles on chemistry, has died at Geneva, at the age of 82.

MR. JOHN RUSSELL AGNEW, of Cardiff, manager of the South Wales branch of Blacklock and MacArthur, oil importers and paint manufacturers, aged 69. Mr. Agnew was also chairman of the South Wales Federation of Paint Manufacturers.

PROFESSOR HUGH RYAN, M.A., D.Sc., State Chemist to the Irish Free State since 1924, whose death was announced last week, studied physics and chemistry at Queen's College, Galway, afterwards proceeding to the University of Berlin where he undertook researches in organic chemistry under Professors Fischer and Gabriel. He became a Doctor of Science in 1899. He was on the Board of Governors of the University College, Dublin, and the Council of the Royal Irish Academy. Professor Ryan was the author of a number of papers on glucosides and waxes.

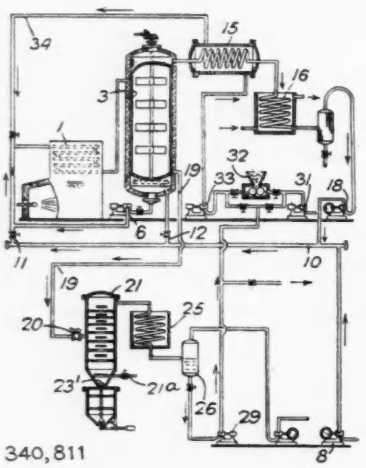
Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Accepted Specifications

340,811. DESTRUCTIVE HYDROGENATION. Standard Oil Development Co., Linden, N.J., U.S.A. Assignees of R. P. Russell, 1829, Tulip Road, Baton Rouge, Louisiana, U.S.A. International Convention date, January 22, 1929.

Petroleum, tar and suspensions of coal in oil are destructively hydrogenated and a portion of the reaction mixture is then



340,811

subjected to reduced pressure to distil part of the hydrocarbon liquid. Oil passes from a pipe still 1 to a reaction vessel 3, from which part is returned by a pipe 6 to the still. Hydrogen is supplied by a compressor 8 to the still and to the reaction vessel, and vapour is drawn off from the vessel to heat exchanger 15 and condenser 16. The residual hydrogen is freed from hydrogen sulphide and gaseous hydrocarbons and is returned to the system by pump 18. Part of the reaction mixture is drawn off through pipe 19 and reducing valve 20 to a chamber 21, from which vapour is taken to a condenser 25 and gas separator 26. The residue passes out through valve 23^1. Oil is supplied to the system by pumps 31, 33 through preheater 15, and pulverised carbonaceous material from a pulveriser 32.

340,862. SYNTHESIS OF AMMONIA. Institut für Physikalische Grundlager der Medizin, 3, Weigertstrasse, Frankfort-on-Main, Germany. International Convention date, March 1, 1929.

A mixture of nitrogen and hydrogen is subjected to the action of dark electric discharges above a temperature of 132°C. and at such a rate of flow that decomposition of the resulting ammonia is prevented. Cobalt nitrate is used as a catalyst or the reaction chamber may be constructed of catalytic material.

340,882. INSECTICIDES. Imperial Chemical Industries, Ltd., Millbank, London. From Grasselli Chemical Co., 1300, Guardian Building, Cleveland, Ohio, U.S.A. Application date, March 18, 1930.

Finely ground pyrolusite is treated with arsenious acid at temperatures above 100° C. and at a steam pressure of 80 lb. per sq. in., and then under similar conditions with 5—30 per cent. of calcium, magnesium, or barium hydroxide, in the presence of a catalyst such as nitric acid or nitrobenzene. The reaction may be conducted in a rotating autoclave or pressure ball mill in which the contact surfaces are of lead. The product is a manganese arsenate containing 40—50 per cent. total As_2O_5 and less than 1 per cent. water-soluble As_2O_5.

340,949. CRACKING OILS. W. W. Triggs, London. From Panhandle Refining Co., Wichita Falls, Tex., U.S.A. Application date, June 29, 1929.

Oils are cracked and preheated in two sets of coils in separate compartments, each having a heating burner. Outlet flues are provided at both ends of the preheating compartment, which also communicates with the cracking compartment at the end remote from the burner. Adjustable dampers are provided in the outlet flues, so that the quantity of hot gas drawn over the preheating coil may be varied.

340,984. RECOVERING OILS. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, July 30, 1929.

Tars or mineral oils are treated with complex compounds obtained from an anhydrous metallic or non-metallic halide and an alcohol or organic acid. The temperature is such that the complex compounds form additive compounds with oxygen derivatives of unsaturated hydrocarbons in the tars or oils, and these are separated and decomposed with water. The halide employed may be chloride of zinc, calcium, aluminium, stannic chloride or antimony pentachloride, the alcohol may be methyl, ethyl or propyl, and the acid may be formic, acetic, chloracetic or lactic. Substances recovered include carveol, croton-aldehyde, cinnamic aldehyde, terpineol, and alcohols of the series $C_nH_{2n-4}O_n$ and $C_n H_{2n-2}O$.

341,047. NITRILES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, October 15, 1928. Addition to 300,130.

Hydrocyclic nitriles are obtained by condensing αβ-unsaturated nitriles containing the grouping $-C_1=C_1-C\equiv N$ in the form of a chain with aliphatic or hydroaromatic compounds having conjugated C=C double bonds, *e.g.*, cyclopentadiene, cyclohexadienes and butadienes. Thus, crotonic acid nitrile is condensed with cyclopentadiene to obtain endomethylene - 3 : 6-tetrahydro-$\triangle^4$-1-methyl-2-cyanobenzene, and crotonic acid nitrile is condensed with 2 : 4-dimethyl-butadiene to obtain $\triangle^4$-tetrahydro-1 : 3 : 5-trimethyl-2-cyano-benzene.

341,053. WETTING AGENTS. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, August 7, 1929.

Aliphatic and cyclo-aliphatic acids are treated with secondary amines of the aliphatic, cycloaliphatic, heterocyclic, aromatic-aliphatic or aromatic series in the absence of metal halides having a condensing action, and the resulting amides are sulphonated if they do not already contain a sufficient number of sulphuric ester or sulphonic groups. The secondary amines must be free from hydroxy groups and any aryl or aralkyl radicle attached to the nitrogen must not contain a substituent other than sulphonic groups. In an example an alcoholic solution of oleic methyl ester and diethylamine is boiled, and the oleic diethylamide sulphonated with sulphuric acid in the presence of trichlorethylene. Other examples describe the sulphonation of oleic ethylanilide, oleic diphenylamide, etc. Suitable aliphatic carbonylic acids and derivatives include lactic acid, propionic acid, resinic acids, naphthenic acids, fatty acids from the oxidation of paraffin wax, oleic sulphonic acid, oleic sulphonic methyl ester, oleic methyl ester sulphonic ester, vicinoleic sulphuric ester, castor and other vegetable and animal oils and their free acids, caproic acid, sulphoacetic acid and sodium palmitic sulphonate, and secondary amines include piperidine, morpholine, benzyl-naphthylamine, altylnaphthylamines, diphenylamine, methyl-benzylamine, diethylamine, and secondary amines containing cyclohexyl, butyl, hexyl or cetyl groups. The products are wetting, dispersing and emulsifying agents.

341,060. ELIMINATING IRON FROM CLAY OR SILICA. Vereinigte Stahlwerke Akt.-Ges., 67, Breitestrasse, Düsseldorf, Germany. International Convention date, October 12, 1928.

Kaolin, chamotte, clay, or kieselguhr are treated at temperatures up to 500° C. with reducing gases, and then with gases containing carbon monoxide at temperatures up to 200° C. to form and volatilise iron as iron carbonyl. The material may then be oxidised and again reduced and treated with carbon monoxide to remove remaining traces of iron.

341,068. Motor Spirit. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 3, 1929.

The hydrocarbon mixture obtained by catalytic hydrogenation of aldehydes or alcohols containing more than three carbon atoms, especially those containing branched or side chains, are added to motor fuel such as petroleum, cracked hydrocarbons, ether or alcohol to obtain anti-knocking properties. In the production of methanol from carbon monoxide and hydrogen, isobutyl oils are also formed and their yield may be increased by using as catalyst a difficultly reducible metal oxide mixed with hydroxide or a salt of potassium. These isobutyl oils are treated with hydrogen at 370° C., and under 200 atmospheres pressure in the presence of molybdic aicd, zinc oxide and magnesia, and the product is added to Pennsylvanian crude oil.

Specifications Accepted with Date of Application

345,204. Condensation products from ortho-chlorphenol. R. Tonkin, J. Thomas and Scottish Dyes, Ltd. December 4, 1929.

345,234. Conversion of carbon dioxide to monoxide, particularly in the reduction of iron ores. B. M. S. Kallaing and C. von Delwig. December 10, 1928.

345,238. Nitrogenising alloys of iron and steel. F. Krupp Akt.-Ges. December 20, 1929.

345,239. Coloured synthetic rubber. I.G. Farbenindustrie Akt.-Ges. and J. Y. Johnson. December 16, 1929. Addition to 241,214.

345,249. Extraction of organic substances. J. Y. Johnson (*I.G. Farbenindustrie Akt.-Ges.*). September 12, 1929.

345,253. Unsaturated ethers. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) December 12, 1929.

345,270. Butadiene or its homologues. I.G. Farbenindustrie Akt.-Ges. December 18, 1928.

345,271. Ketones. H. Dreyfus. December 18, 1929.

345,272. Distillation of hydrocarbons. Barrett Co. December 18, 1928.

345,276 and 345,310. Synthetic resin varnishes and synthetic resins. Imperial Chemical Industries, Ltd., A. A. Drummond and H. H. Morgan. September 13, 1929.

345,277. Dyestuff intermediates. R. J. Loveluck, J. Thomas and Scottish Dyes, Ltd. September 13, 1929.

345,282. Conversion of liquid carbonaceous materials into more valuable products by destructive hydrogenation. H. D. Elkington. (*Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij.*) October 15, 1929.

345,305. Destructive hydrogenation. H. W. Strong and Imperial Chemical Industries, Ltd. December 20, 1929.

345,334. Hydrocarbons of high boiling point, particularly viscous hydrocarbons from hydrocarbons of low boiling point. J. Y. Johnson. (*I.G. Farbindustrie Akt.-Ges.*) December 18, 1929.

345,335. Vulcanisation processes. J. E. Pollak. (*W. B. Wiegand.*) December 19, 1929.

345,351. Obtaining metals from sulphide ores. C. Goetz. October 23, 1929. Addition to 342,293.

345,349. Indigoid dyestuffs. I.G. Farbenindustrie Akt.-Ges. December 22, 1928.

345,368. Organic acids. F. J. Cahn. January 4, 1929.

345,391. Oxygenated organic compounds. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) January 16, 1930. Addition to 312,388.

345,397. Imino ethers. K. F. Schmidt and P. Zutavern. January 18, 1930. Addition to 331,947.

345,431. Roasting and agglomerating ores. A. Dawans. April 6, 1929.

345,445. Alloys. R. Wellesley. February 24, 1930.

345,451. Diammonium phosphate. Soc. d'Etudes Scientifiques et d'Entreprises Industrielles. February 26, 1929.

345,457. Treatment of industrial gases. Compagnie Generale de Construction de Fours. March 2, 1929.

345,464. Testing the purity of solid or liquid hydrocarbons. A. Esau. March 13, 1929.

345,494. Ammonium carbonate. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) March 24, 1930.

345,496 and 345,511. Treating gases or mixtures of gases and vapours in the presence of catalytic or purifying agents, and reactivation of such agents. Compagnie Internationale pour La Fabrication des Essences et Petroles. August 2, 1929, and January 13, 1930. 345,511 addition to 345,496.

345,518. Dehydration of magnesium chloride. E. Lacell. April 5, 1929.

345,556-7. Sulphur trioxide. Calco Chemical Co. Inc. May 13, 1929.

345,565. Dephlegmator or bubble towers. H. Moore and Johnson and Co. (Refinery Engineers), Ltd. May 19, 1930.

345,591. Nitric acid. Lodge-Cottrell, Ltd. (*Metallges Akt.-Ges.*) June 27, 1930.

345,594. Removing sulphur from industrial gases by a cyclic process with extraction of pure sulphur. S. Hunyady and K. Koller. July 2, 1930.

345,596. Refining hydrocarbons. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. July 15, 1929.

Applications for Patents

[In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.]

Barnes, R. S., Hooley, L. J., Imperial Chemical Industries, Ltd., and Thomas, J. Dyestuffs. 9,171. March 25.

Bunbury, H. M., Davies, J. S. H., Imperial Chemical Industries, Ltd., and Maunton, W. J. S. Sulphur-containing compounds, etc., and their application as vulcanisation accelerators for rubber, etc. 8,932. March 23.

—— Treatment of oxidisable organic compounds. 9,049. March 24.

Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of tribromo-ethylalcohol. 9,027. March 24.

—— Manufacture of artificial fibres or films from cellulose esters. 9,150. March 25.

—— Manufacture of dyed artificial fibres or films from cellulose esters. 9,151. March 25.

—— Manufacture of amino-ethers. 9,494. March 28.

Carter, D., and Imperial Chemical Industries, Ltd. 8,933. Dyeing. March 23.

Coffey, S., and Goldstein, R. F. Manufacture of barbituric acids. 8,931. March 23.

—— Manufacture of organic intermediates for manufacture of dyestuffs. 9,344. March 27.

Distillers Co., Ltd., and Langwell, H. Manufacture of emulsions. 8,864. March 23.

Du Pont de Nemours and Co., E. I. Synthetic resins. 9,120. March 25. (United States, March 25, 1930.)

—— Fuel oils. 9,121. March 25. (United States, March 25, 1930.)

—— Manufacture and application of derivatives of 2 : 3 hydroxynaphthoic acid. 9,122. March 25. (United States, March 25, 1930.)

—— Coating-compositions. 9,123. March 25. (United States, March 25, 1930.)

—— Flashless propellent powder. 9,411. March 27. (United States, May 16, 1930.)

Fourton, F. A. G. Separating solids from liquids. 9,293. March 26.

Frischer, H. Manufacture of nitric acid. 8,937. March 23.

Goldstein, R. F., and Imperial Chemical Industries, Ltd. Manufacture of carboxylic acid halides. 9,172. March 25.

Groves, W. W., and I.G. Farbenindustrie Akt.-Ges. Manufacture of hydroxycarboxylic acid arylides. 9,252. March 26.

I.G. Farbenindustrie Akt.-Ges., and Johnson, J. Y. Dehalogenation of organic compounds. 9,025. March 24. (June 19, 1930.)

—— Manufacture of derivatives of polyhydric alcohols. 9,266. March 26.

—— Manufacture of hydrocarbons of low boiling point, etc. 9,267. March 26.

—— Manufacture of glass. 9,268. March 26.

—— Refining crude hydrocarbons. 9,373. March 27.

—— Purification of acetylene. 9,374. March 27.

—— Manufacture of shaped masses. 9,375. March 27.

—— Removal of phenols from hydrocarbons. 9,376. March 27.

—— Manufacture of amino-ethers. 9,494. March 28.

I.G. Farbeninstustrie Akt.-Ges. Three-colour photography. 9,136, March 25. (Germany, March 25, 1930.)

Imperial Chemical Industries, Ltd. Installation for forcing fluid into receiver under pressure. 8,810. March 23.

—— Sulphonated products. 8,930. March 23.

—— Coating iron and steel with lead. 9,050. March2 4.

—— Purification of cellulose benzyl ether, etc. 9,170. March 25.

—— Manufacture of leather cloth, etc. 9,173. March 25.

—— Casting nickel. 9,174. March 25.

—— Viscosity screw pumps or glands. 9,175. March 25.

Imperial Chemical Industries, Ltd., and Jew, E. A. Manufacture of barbituric acids. 8,931. March 23.

Imperial Chemical Industries, Ltd., and Schofield, J. E. Manufacture of organic intermediates for manufacture of dyestuffs. 9,344. March 27.

Schering-Kahlbaum Akt.-Ges. Manufacture of terpenes. 9,153. March 25. (Germany, April 15, 1930.)

Soc. of Chemical Industry in Basle. Process for impregnating materials. 8,858. March 23. (Switzerland, March 22, 1930.,

—— Manufacture of dyestuffs. 9,368. March 27. (Switzerland) March 27, 1930.)

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£18 15s. per ton d/d address U.K. in casks.

ACID CHROMIC.—1s. per lb., less 2½% d/d U.K.

ACID HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d, according to purity, strength and locality.

ACID NITRIC, 80° Tw.—Spot, £20 to £25 per ton makers' works, according to district and quality.

ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

AMMONIA (ANHYDROUS).—Spot, 10d. per lb., d/d in cylinders.

AMMONIUM BICHROMATE.—8½d. per lb. d/d U.K.

BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.

BLEACHING POWDER, 35/37%.—Spot, £7 19s. per ton d/d station in casks, special terms for contracts.

BORAX, COMMERCIAL.—Crystals, £13 10s. per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags. carriage paid any station in Great Britain. Prices quoted are for one ton lots and upwards).

CALCIUM CHLORIDE (SOLID), 70/75%.—Spot, £4 15s. to £5 5s. per ton d/d station in drums.

CHROMIUM OXIDE.—9d. to 9½d. per lb. according to quantity d/d U.K.

CHROMETAN.—Crystals, 3½d. per lb. Liquor, £18 12s. 6d. per ton d/d U.K.

COPPER SULPHATE.—£25 to £25 10s. per ton.

METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 7d. to 1s. 11d. per gall.; pyridinised industrial, 1s. 9d. to 2s. 1d. per gall.; mineralised, 2s. 8d. to 2s. 11d. per gall. 64 O.P., 1d. extra in all cases. Prices according to quantity.

NICKEL SULPHATE.—£38 per ton d/d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

POTASH CAUSTIC.—£30 to £33 per ton.

POTASSIUM BICHROMATE CRYSTALS AND GRANULAR.—4¼d. per lb. nett d/d U.K., discount according to quantity: ground ½d. per lb. extra.

POTASSIUM CHLORATE.—3¾d. per lb. ex-wharf, London, in cwt. kegs.

POTASSIUM CHROMATE.—8½d. per lb. d/d U.K.

SALAMMONIAC.—Firsts lump, spot, £40 17s. 6d. per ton d/d address in barrels. Chloride of ammonia, £37 to £45 per ton, carr. paid.

SALT CAKE, UNGROUND.—Spot, £3 10s. per ton d/d station in bulk.

SODA ASH, 58%.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.

SODA CAUSTIC, SOLID, 76/77%.—Spot, £14 10s. per ton, d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton, d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE 97/98%.—£21 per ton.

SODIUM BICARBONATE, REFINED.—Spot, £10 10s. per ton d/d station in bags.

SODIUM BICHROMATE CRYSTALS (CAKE AND POWDER)—3½d. per lb. nett d/d U.K., discount according to quantity. Anhydrous ¾d. per lb. extra.

SODIUM BISULPHITE POWDER, 60/62%.—£16 10s. per ton delivered 1-cwt. iron drums for home trade.

SODIUM CHLORATE.—2¾d. per lb.

SODIUM CHROMATE.—3⅜d. per lb. d/d U.K.

SODIUM NITRITE.—Spot, £19 per ton, d/d station in drums.

SODIUM PHOSPHATE.—£14 10s. per ton, f.o.r. London, casks free.

SODIUM SILICATE, 140° Tw.—Spot, £8 5s. per ton, d/d station returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—Spot, £4 2s. 6d. per ton, d/d address in bags.

SODIUM SULPHIDE SOLID, 60/62%.—Spot, £10 5s. per ton, d/d station in drums. Crystals—Spot, £7 10s. per ton, d/d station in returnable casks.

SODIUM SULPHITE, PEA CRYSTALS.—Spot, £13 10s. per ton, d/d station in kegs. Commercial—Spot, £9 per ton, d/d station in bags.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—5d. to 6½d. per lb. Crude 60's 1s. to 1s. 1d. per gall. August/December.

ACID CRESYLIC 99/100.—1s. 9d. to 1s. 10d. per gall. B.P., 3s. 6d. per gall. 97/99.—Refined, 2s. 2d. to 2s. 3d. per gall. Pale, 98%, 1s. 8d. to 1s. 9d. Dark, 1s. 4d. to 1s. 4½d.

ANTHRACENE OIL, STRAINED (GREEN OIL).—4½d. to 4¾d. per gall.

BENZOLE.—Prices at works: Crude, 5½d. to 6½d. per gall.; Standard Motor, 1s. to 1s. 1d. per gall. 90%.—1s. 1d. to 1s. 2d. per gall. Pure, 1s. 4d. to 1s. 5d. per gall. (The above prices were operative from March 3 last.)

TOLUOLE.—90%, 1s. 8d. per gall. Pure, 1s. 10d. per gall.

XYLOL.—1s. 7d. to 1s. 8d. per gall. Pure, 1s. 10d to 1s. 11d. per gall.

CREOSOTE.—Standard specification, for export, 5½d. per gall. f.o.b.; for Home, 4d. per gall. d/d.

NAPHTHA.—Solvent, 90/160, 1s. 3d. per gall. Solvent, 95/160, 1s. 3d. to 1s. 4d. per gall. Solvent, 90/190, 1s. to 1s. 2d. per gall.

NAPHTHALENE.—Purified Crystals, £11 11s. per ton.

PITCH.—Medium soft, 45s. per ton, in bulk at makers' works.

PYRIDINE.—90/140, 3s. 6d. to 3s. 9d. per gall. 90/160, 3s. 3d. to 3s. 6d. per gall. 90/180, 1s. 9d. to 2s. per gall.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:—

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.

ACID ANTHRANILIC.—6s. per lb. 100%.

ACID GAMMA.—Spot, 3s. 6d. per lb. 100% d/d buyer's works.

ACID H.—Spot, 2s. 3d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 2d. per lb. 100% d/d buyer's works.

ACID NEVILLE AND WINTHER.—Spot, 2s. 6d. per lb. 100% d/d buyer's works.

ACID SULPHANILIC.—Spot, 8¼d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8¼d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8¼d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra, d/d buyer's works.

BENZIDINE BASE.—Spot, 2s. 6d. per lb. 100% d/d buyer's works.

BENZOIC ACID.—Spot, 1s. 8½d. per lb. d/d buyer's works.

o-CRESOL 30/31° C.—£2 6s. 5d. per cwt., in 1-ton lots.

m-CRESOL 98/100%.—2s. 9d. per lb., in ton lots.

p-CRESOL 34·5° C.—1s. 9d. per lb., in ton lots.

DICHLORANILINE.—2s. 5d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., packages extra, d/d buyer's works.

DINITROBENZENE.—7½d. per lb.

DINITROCHLORBENZENE.—£74 per ton d/d.

DINITROTOLUENE.—48/50° C., 7d. per lb.; 66/68° C., 7¾d. per lb.

DIPHENYLAMINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

a-NAPHTHOL.—Spot, 1s. 11d. per lb. d/d buyer's works.

B-NAPHTHOL.—Spot, £65 per ton in 1 ton lots, d/d buyer's works.

a-NAPHTHYLAMINE.—Spot, 1s. per lb. d/d buyer's works.

B-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.

o-NITRANILINE.—5s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 6d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 6½d. per lb., 5-cwt. lots, drums extra, d/d buyer's works.

NITRONAPHTHALENE.—9d. per lb.

R. SALT.—Spot, 2s. per lb. 100% d/d buyer's works.

SODIUM NAPHTHIONATE.—Spot, 1s. 6d. per lb. 100% d/d buyer's works.

o-TOLUIDINE.—Spot, 8d. per lb., drums extra, d/d buyer's works.

p-TOLUIDINE.—Spot, 1s. 6d. per lb. d/d buyer's works.

m-XYLIDINE ACETATE.—3s. 3d. per lb., 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £7 10s. per ton. Grey, £12 to £12 10s. per ton. Liquor, 9d. per gall.

ACETONE.—£60 to £62 10s. per ton.

CHARCOAL.—£6 to £9 per ton, according to grade and locality.

IRON LIQUOR.—10d. to 1s. 4d. per gall.

RED LIQUOR.—9d. per gall.

WOOD CREOSOTE.—1s. 9d. per gall., unrefined.

WOOD NAPHTHA, MISCIBLE.—2s. 11d. per gall. Solvent, 3s. 9d. to 4s. per gall.

WOOD TAR.—£4 to £5 per ton.

BROWN SUGAR OF LEAD.—£37 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6d. to 1s. 2d. per lb. according to quality; Crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC SULPHIDE, YELLOW.—1s. 7d. to 1s. 9d. per lb.

BARYTES.—£6 to £7 10s. per ton, according to quality.

CADMIUM SULPHIDE.—4s. 6d. to 5s. per lb.

CARBON BISULPHIDE.—£26 to £28 per ton, according to quantity; drums extra.

CARBON BLACK.—3¼d. to 4⅛d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity. drums extra.

CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.

DIPHENYLGUANIDINE.—2s. 6d. per lb.

INDIARUBBER SUBSTITUTES, WHITE.—4⅝d. to 5⅛d. per lb.; Dark, 4⅛d. to 4⅞d. per lb.

LAMP BLACK.—£28 per ton, barrels free.

LITHOPONE, 30%.—£19 to £21 per ton.

SULPHUR.—£9 10s. to £13 per ton, according to quality.

SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.

SULPHUR PRECIP. B.P.—£55 to £60 per ton, according to quantity.

VERMILION, PALE OR DEEP.—6s. 6d.-7s. per lb.

ZINC SULPHIDE.—8d. to 11d. per lb.

Pharmaceutical and Photographic Chemicals

ACETANILIDE.—1s. 4d. per lb. for 1-cwt. lots.
ACID, ACETIC, PURE, 80%.—£37 5s. per ton d/d address U.K. in casks.
ACID, ACETYL SALICYLIC.—2s. 7d. to 2s. 9d. per lb., according to quantity.
ACID, BENZOIC B.P.—1s. 9d. to 1s. 10d. per lb., for synthetic product. Solely ex Gum, 1s. 3d. to 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.
ACID, BORIC B.P.—Crystal, £31 per ton; powder, £32 per ton; For one-ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.
ACID, CAMPHORIC.—19s. to 21s. per lb.
ACID, CITRIC.—1s. 0½d. per lb., less 5%.
ACID, GALLIC.—2s. 11d. per lb. for pure crystal, in cwt. lots.
ACID, MOLYBDIC.—5s. 3d. per lb. in ½-cwt. lots. Packages extra. Special prices for quantities and contracts.
ACID, PYROGALLIC, CRYSTALS.—7s. 6d. per lb. for 28-lb. lots, Resublimed, 8s. 6d. per lb. for 28-lb. lots.
ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 8d. per lb. Technical.—1s. to 1s. 2d. per lb.
ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.
ACID, TARTARIC.—1s. 0½d. per lb., less 5%.
AMIDOL.—7s. 6d. to 11s. 3d. per lb., according to quantity.
AMMONIUM BENZOATE.—3s. 9d. per lb.
AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5-cwt. casks. Resublimated, 1s. per lb.
AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ½-cwt. lots. Packages extra. Special prices for quantities and contracts.
ARGENT. NITRAS, CRYSTALS.—1s. 1d. per oz.
ATROPHINE SULPHATE.—8s. per oz.
BARBITONE.—5s. 9d. to 6s. per lb.
BISMUTH CARBONATE.—6s. 9d. per lb.
BISMUTH CITRATE.—8s. per lb.
BISMUTH SALICYLATE.—7s. 3d. per lb.
BISMUTH SUBNITRATE.—6s. per lb.
BISMUTH NITRATE.—Cryst. 5s. per lb.
BISMUTH OXIDE.—9s. 10d. per lb.
BISMUTH SUBCHLORIDE.—9s. 7d. per lb.
BISMUTH SUBGALLATE.—7s. 3d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.
BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb. Liquor Bismuth B.P., in W. Qts., 1s. 2d. per lb.; 6 W. Qts., 11½d. per lb.; 12 W. Qts., 10d. per lb.; 36 W. Qts., 9½d. per lb.
BORAX B.P.—Crystal, £21 10s. per ton; powder, £22 per ton; for one-ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.
BROMIDES.—Ammonium, 1s. 9d. per lb.; potassium, 1s. 4½d. per lb.; granular, 1s. 5d. per lb.; sodium, 1s. 7d. per lb. Prices for 1-cwt. lots.
CAFFEIN, PURE.—6s. 6d. per lb.
CAFFEIN CITRAS.—5s. per lb.
CALCIUM LACTATE.—B.P., 1s. to 1s. 6d. per lb., according to quantity.
CAMPHOR.—Refined flowers, 2s. 10d. to 3s. per lb., according to quantity; also special contract prices.
CHLOROFORM.—2s. 3d per lb., according to quantity.
EMETINE HYDROCHLORIDE.—58s. 6d. per oz.
EMETINE BISMUTH IODIDE.—33s. per oz.
EPHEDRINE, PURE.—12s. 6d. to 13s. 6d. per oz.
EPHEDRINE HYDROCHLORIDE.—9s 9d. to 10s. 6d. per oz.
EPHEDRINE SULPHATE.—9s. 9d. to 10s. 6d. per oz.
ERGOSTEROL.—2s. 6d. per gm.
ETHERS.—S.G. ·730—1s. to 1s. 1d. per lb., according to quantity; other gravities at proportionate prices.
FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.
GLUCOSE, MEDICINAL.—1s. 6d. to 2s. per lb. for large quantities.
HEXAMINE.—2s. 3d. to 2s. 6d. per lb.
HOMATROPINE HYDROBROMIDE.—27s. 6d. per oz.
HYDRASTINE HYDROCHLORIDE.—90s. per oz. for small quantities.
HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 3s. per gall.
HYDROQUINONE.—3s. 9d. to 4s. per lb., in cwt. lots.
HYPOPHOSPHITES.—Calcium, 2s. 11d. to 3s. 4d. per lb.; potassium, 3s. 2d. to 3s. 7d. per lb.; sodium, 3s. 1d. to 3s. 6d. per lb.; for 28-lb. lots.
IRON AMMONIUM CITRATE.—B.P., 1s. 11d. per lb., for 28-lb. lots. Green, 2s. 6d. per lb., list price. U.S.P., 2s. 9d. per lb. list price.
IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.
IRON QUININE CITRATE.—B.P., 8½d. to 8¾d. per oz., according to quantity.
MAGNESIUM CARBONATE.—Light B.P., 36s. per cwt.
MAGNESIUM OXIDE.—Light Commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.
MENTHOL.—A.B.R. recrystallised B.P., 14s. per lb. net; Synthetic, 8s. 6d. to 12s. per lb.; Synthetic detached crystals, 8s. 6d. to 10s. per lb., according to quantity; Liquid (95%), 9s. per lb
MERCURIALS B.P.—Up to 1-cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.
METHYL SALICYLATE.—1s. 3d. to 1s. 5d per lb.
PARAFORMALDEHYDE.—1s. 8d. per lb.
PARALDEHYDE.—1s. 1d. per lb.
PHENACETIN.—3s. 9d. to 4s. 1d. per lb.
PHENOLPHTHALEIN.—5s. to 5s. 2½d. per lb.
PILOCARPINE NITRATE.—10s. 6d. per oz.
POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—83s. per cwt., less 2½ per cent.
POTASSIUM CITRATE.—B.P., 1s. 9d. per lb. for 28-lb. lots.
POTASSIUM FERRICYANIDE.—1s. 7½d. per lb., in 125-lb. kegs.
POTASSIUM IODIDE.—16s. 8d. to 17s. 9d. per lb., as to quantity.
POTASSIUM METABISULPHITE.—50s. per cwt. d/d London, kegs free.
POTASSIUM PERMANGANATE.—B.P. crystals, 5½d. per lb., spot.
QUININE SULPHATE.—1s. 8d. per oz. for 1,000-oz. lots.
QUINOPHAN.—B.P.C., 14s. 6d. to 16s. 6d. per lb. for cwt. lots.
SACCHARIN.—43s. 6d. per lb.
SALICIN.—16s. 6d. to 17s. 6d. per lb., according to quantity.
SILVER NITRATE.—10d. per oz. for 500-oz. lots, sticks, 2d. per oz. extra.
SODIUM BARBITONUM.—8s. 6d. to 9s. per lb. for 1-cwt. lots.
SODIUM BENZOATE B.P.—1s. 5d. per lb. for 1-cwt. lots.
SODIUM CITRATE.—B.P.C. 1911, 1s. 6d. per lb. B.P.C. 1923, and U.S.P., 1s. 10d. per lb. for 28-lb. lots.
SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.
SODIUM NITROPRUSSIDE.—16s. per lb.
SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—80s. per cwt. net, ton lots, d/s of 5 cwt. Crystals, 2s. 6d. per cwt. extra.
SODIUM SALICYLATE.—Powder, 1s. 10d. to 2s. 2d. per lb. Crystal, 1s. 11d. to 2s. 3d. per lb.
SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 2d. per lb.
SODIUM SULPHITE, ANHYDROUS.—£27 10s. to £29 10s. per ton, according to quantity. Delivered U.K.
STRYCHNINE, ALKALOID CRYSTAL, 2s. per oz.; hydrochloride, 1s. 9½d. per oz.; nitrate, 1s. 8d. per oz.; sulphate, 1s. 9d. per oz., for 1,000-oz. quantities.
TARTAR EMETIC, B.P.—Crystal or powder, 1s. 9d. to 2s. per lb.
THYMOL.—Puriss, 6s. to 7s. per lb., according to quantity. Natural, 12s. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.
AUBEPINE (EX ANETHOL).—9s. per lb.
AMYL ACETATE.—2s. 3d. per lb.
AMYL BUTYRATE.—4s. 9d. per lb.
AMYL CINNAMIC ALDEHYDE.—9s. per lb.
AMYL SALICYLATE.—2s. 6d. per lb.
ANETHOL (M.P. 21/22° C.).—5s. 6d. per lb.
BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.
BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—1s. 9d. per lb.
BENZYL ALCOHOL FREE FROM CHLORINE.—1s. 9d. per lb.
BENZYL BENZOATE.—2s. 4d. per lb.
CINNAMIC ALDEHYDE NATURAL.—11s. 9d. per lb.
COUMARIN.—12s. per lb.
CITRONELLOL.—6s. 6d. per lb.
CITRAL.—6s. 6d. per lb.
ETHYL CINNAMATE.—6s. 9d. per lb.
ETHYL PHTHALATE.—2s. 6d. per lb.
EUGENOL.—8s. 9d. per lb.
GERANIOL.—6s. to 10s. per lb.
HELIOTROPINE.—5s. 9d. per lb.
METHYL ANTHRANILATE.—6s. 3d. per lb.
METHYL BENZOATE.—4s. 3d. per lb.
PHENYL ETHYL ACETATE.—10s. per lb.
PHENYL ETHYL ALCOHOL.—8s. 3d. per lb.
RHODINOL.—40s. per lb.
SAFROL—1s. 6d. per lb.
VANILLIN, EX CLOVE OIL.—14s. 6d. to 16s. 6d. per lb. Ex Guaiacol.—13s. to 15s. per lb.

Essential Oils

ANISE OIL.—2s. 9d. per lb.
BERGAMOT OIL.—9s. per lb.
BOURBON GERANIUM OIL.—17s. per lb.
CAMPHOR OIL.—White, 2s. per lb.; Brown, 1s. 6d. per lb.
CINNAMON OIL LEAF.—5s. per oz.
CITRONELLA OIL.—Java, 2s. 3d. per lb., c.i.f. Pure Ceylon, 2s. 3d. per lb.
CLOVE OIL, 90/92%.—7s. per lb.
EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%—1s. 9d. per lb.
LAVENDER OIL.—Mont Blanc, 38/40%, 8s. 6d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.

London, April 9, 1931.

PRICES have remained steady, although business has been a little quiet owing to the Easter holidays.

General Chemicals

ACETONE.—Firm at £60/63 per ton according to quantity with a satisfactory demand.

ACID, ACETIC.—£36 5s. to £38 5s. per ton for technical 80% and £37 5s. to £39 5s. for pure 80% with a regular demand.

ACID, CITRIC.—Weak at about 1s. 1d. to 1s. 1¾d. per lb., less 5%.

ACID, FORMIC 85%.—Technical, £38 per ton and in steady demand.

ACID, LACTIC.—In fair demand at £39/40 per ton for the 50% by weight, pale quality.

ACID, OXALIC.—Firm and unchanged at £30 7s. 6d. to £32 per ton according to quantity.

ACID, TARTARIC.—11¾d. to 1s. per lb., less 5%.

ALUMINIUM SULPHATE.—In steady request at £7 15s. to £8 5s. per ton the 17/18% iron free quality.

ARSENIC.—Firm at £19 to £19 10s. per ton.

BARIUM CHLORIDE.—£9 10s. to £10 per ton. The improved demand continues.

CREAM OF TARTAR.—82s. per cwt. to 83s. per cwt., ex warehouse London.

COPPER SULPHATE.—About £22 to £22 10s. per ton, less 5% free on rails London.

FORMALDEHYDE.—In good demand at £30 to £30 10s. per ton.

LEAD ACETATE.—Still remains unchanged at £34 5s. per ton for white; brown, £1 per ton less.

LEAD NITRATE.—About £29 10s. per ton.

LITHOPONE.—£18 to £22 per ton according to grade and quantity.

POTASSIUM BICHROMATE.—4¼d. per lb., with usual discounts for contracts.

POTASSIUM CHLORATE.—£28 to £30 per ton.

POTASSIUM PERMANGANATE.—In good demand at 5¼d. per lb. to 5½d. per lb., ex wharf London.

SODIUM BICHROMATE.—In good request at 3½d. per lb., with discounts for contracts.

SODIUM CHLORATE.—Unchanged and firm at £26 10s. per ton and in good request.

SODIUM HYPOSULPHITE.—Photographic crystals, £14 5s. per ton and in good demand; commercial quality quiet at about £8 10s. per ton.

SODIUM PRUSSIATE (YELLOW).—Firm at 4¾d. to 5¼d. per lb., according to quantity.

TARTAR EMETIC.—The demand continues to increase at 10¾d. per lb.

ZINC SULPHATE.—£11 to £11 10s. per ton.

Coal Tar Products

THERE is no change to report in the Coal Tar Products market from last week, and prices remain the same.

MOTOR BENZOL.—Quoted at 1s. 4½d. to 1s. 5½d. per gallon f.o.r.

SOLVENT NAPHTHA.—Remains at 1s. 1½d. to 1s. 2d. per gallon f.o.r.

HEAVY NAPHTHA.—Obtainable at 11d. to 1s. 0½d. per gallon f.o.r.

CREOSOTE OIL.—Unchanged at about 3d. to 3½d. per gallon f.o.r. in the north, and at 4d. to 4½d. per gallon in London.

CRESYLIC ACID.—Remains at about 1s. 8d. per gallon for the 98/100% quality, and at about 1s. 6d. per gallon for the dark quality 95/97%.

NAPHTHALENES.—The firelighter quality is quoted at £3 10s. to £3 15s. per ton; the 74/76 quality at £4 to £4 5s. per ton; the 76/78 quality at about £5 per ton.

PITCH.—Obtainable at 37s. 6d. to 40s. per ton, f.o.b. East Coast Port.

Nitrogen Fertilisers

Sulphate of Ammonia.—Export.—The market continues quiet, with prices unchanged at £7 per ton f.o.b. U.K. port in single bags for neutral quality 20·6 per cent. nitrogen. *Home.*—The very brisk demand reported in Scotland last week continues unabated. As supplies from local manufacturers have run out, a large tonnage has been railed from works in the North of England. Merchants in the Midlands report an improved demand, but the position remains quiet in the south. Scale prices continue in operation.

Nitrate of Soda.—No further news concerning this product has reached us.

Latest Oil Prices

LONDON, April 8.—LINSEED OIL closed quiet and 2s. 6d. to 5s. per ton lower. Spot, ex mill, £18 5s.; April, £16 10s.; May-August, £17 2s. 6d.; September-December, £18, naked. RAPE OIL was slow. Crude, extracted, £30 10s.; technical, refined, £32, naked, ex wharf. COTTON OIL was quiet. Egyptian, crude, £21 10s.; refined common edible, £25 10s.; deodorised, £27 10s., naked, ex mill. TURPENTINE was quiet and unchanged. American, spot, 41s. 6d.; May-June, 42s.; Russian, spot, 38s. 6d. per cwt.

HULL.—LINSEED OIL, spot to August, £17 5s., September-December, £17 17s. 6d. per ton, naked. COTTON OIL.—Egyptian, crude, spot, £20 15s.; edible, refined, spot, £23 10s.; technical, spot, £23 5s.; deodorised, £25 10s. per ton. CASTOR OIL.—Pharmacy, spot, 41s. 6d.; firsts, 36s. 6d.; seconds, 34s. 6d. per cwt. PALM KERNEL OIL.—Crude, 5½ per cent., spot, £23 10s. per ton, naked. GROUNDNUT OIL.—Crushed-extracted, spot, £25 10s.; deodorised, £29 10s. per ton. SOYA OIL.—Crushed-extracted, spot, £19 5s.; deodorised, £22 15s. per ton. RAPE OIL.—Crushed-extracted, spot, £29 10s.; refined, £31 10s. per ton. COD OIL nominal at 20s. per cwt. TURPENTINE, 42s. 6d. per cwt.

South Wales By-Products

THERE was a brief spurt in South Wales by-product activities just before the Easter holiday break, but it was not expected that this would continue after the vacation. The pitch demand remains small and sporadic, but quotations are unchanged. Road tar is in fair, steady demand round about 13s. per 40-gallon barrel. Refined tars are not quite so good, but values are unchanged for coke-oven and gasworks tar. Patent fuel and coke exports remain unsatisfactory. Patent fuel prices, for export, are :—20s. 6d. to 21s., ex-ship Cardiff; 19s. 6d. to 20s. ex-ship Swansea and Newport. Coke prices are :—Best foundry, 34s. to 36s. 6d.; good foundry, 22s. 6d. to 25s.; furnace, 16s. 6d. to 17s. 6d.

Scottish Coal Tar Products

WHILE orders are not so plentiful as makers would like, there is a better feeling predominant, and quotations are more regular than they have been for some months. Stocks of some products are being steadily reduced.

Cresylic Acid.—Orders are more numerous, but prices are unchanged. Pale, 99/100%, 1s. 5d. to 1s. 6d. per gallon; pale, 97/99%, 1s. 4d. to 1s. 5d. per gallon; dark, 97/99%, 1s. 3d. to 1s. 4d. per gallon; high boiling, 1s. 8d. to 1s. 9d. per gallon; all ex makers' works.

Carbolic Sixties.—Very quiet at 1s. 4d. to 1s. 6d. per gallon, f.o.r. in bulk quantities.

Creosote Oil.—Some grades are distinctly scarce. Quotations are steady as follows :—Specification oils, 2½d. to 3d. per gallon; gas works ordinary, 3½d. to 3¾d. per gallon; washed oil, 3d. to 3¼d. per gallon; all f.o.r. in bulk.

Coal Tar Pitch.—With few orders passing, values are nominal at 40s. per ton f.a.s. Glasgow for export, and about 42s. 6d. per ton f.o.r. works for home trade.

Blast Furnace Pitch is quietly steady at controlled prices of 30s. per ton f.o.r. works for home trade, and 35s. per ton f.a.s. Glasgow for export.

Refined Coal Tar.—In steady demand by county and borough authorities. Quotations remain keen at 2½d. to 2¾d. per gallon, f.o.r. in buyers' packages.

Blast Furnace Tar remains dull at 2¾d. per gallon.

Crude Naphtha.—Production is low and value is firm at 4¼d. to 4½d. per gallon, ex makers' works.

Water White Products.—There is only a limited demand but, as stocks are within reasonable bounds, quotations are steady. Motor benzol is 1s. 3d. to 1s. 4d. per gallon; 90/160 solvent, 1s. 2d. to 1s. 3d. per gallon; 90/190 heavy solvent, 1s. to 1s. 0½d. per gallon; all at makers' works in bulk.

Alcohol from Natural Gas Waste

A PROCESS for manufacturing industrial alcohol from natural gas waste is reported to have been developed in the laboratories of the Canadian National Research Council, according to the United States Department of Commerce. This process is regarded as a means of utilising the large waste of gas in the Turner Valley oil field of Alberta. It is stated that operating cost, excluding overhead and other charges made for waste as required, will not exceed 25 cents per gallon. Industrial alcohol used annually in Canada at the present time is valued at $2,000,000. It is reported that the waste gas can be readily converted into ethylene, from which alcohol and glycol are subsequently made.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing this firm's independent and impartial opinions.

Glasgow, April 7, 1931.

EASTER has had a strong effect on the Scottish heavy chemical market. Enquiries have fallen to a minimum and business generally has been dull.

Industrial Chemicals

ACETONE.—B.G.S.—£60 to £63 per ton, ex wharf, according to quantity.

ACID, ACETIC.—Prices ruling are as follows: glacial, 98/100%, £47 to £58 per ton; pure, £37 5s. per ton; technical, 80%, £36 5s., delivered in minimum lots of 1 ton.

ACID, BORIC.—Granulated commercial, £22 per ton; crystals, £23; B.P. crystals, £31 per ton; B.P. powder, £32 per ton, in 1-cwt. bags, delivered Great Britain free in one-ton lots upwards.

ACID, HYDROCHLORIC.—Usual steady demand. Arsenical quality, 4s. per carboy. Dearsenicated quality, 5s. per carboy, ex works, full wagon loads.

ACID, NITRIC, 80° QUALITY.—£23 per ton, ex station, full truck loads.

ACID, OXALIC.—98/100%.—On offer at the same price, viz.: 3¼d. per lb., ex store. On offer from the Continent at 3¼d. per lb., ex wharf.

ACID, SULPHURIC.—£3 7s. 6d. per ton, ex works, for 144° quality; £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID, TARTARIC, B.P. CRYSTALS.—Quoted 11¾d. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 1s. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted round about £8 10s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 10s. 0d. per ton., c.i.f. U.K. ports. Crystal meal, about 2s. 6d. per ton less.

AMMONIA ANHYDROUS.—10½d. per lb., containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered, £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 80°.—Unchanged at about 2½d. to 3d. per lb., delivered, according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Spot material obtainable at round about £28 per ton, ex wharf. On offer for shipment from China at about £27 per ton, c.i.f. U.K.

ARSENIC, WHITE POWDERED.—Quoted £22 10s. per ton, ex wharf. Spot material still on offer at £22 15s. per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £9 10s. per ton, c.i.f. U.K. ports. For Continental materials our price would be £8 10s. per ton, f.o.b. Antwerp or Rotterdam.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 15s. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price, £4 15s. to £5 5s. per ton, according to quantity and point of delivery. Continental material on offer at £4 15s. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—At about £3 15s. per ton, f.o.r. works, or £4 12s. 6d. per ton, f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Now quoted £30 10s. per ton, ex store. Continental on offer at about £29 per ton, ex wharf.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 per ton, ex wharf.

LEAD, RED.—Price now £32 per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £42 per ton, carriage paid.

LEAD ACETATE.—White crystals quoted round about £34 to £35 per ton c.i.f. U.K. ports. Brown on offer at about £1 per ton less.

MAGNESITE, GROUND CALCINED.—Quoted £9 7s. 6d. per ton, ex store.

METHYLATED SPIRIT.—Industrial quality 64 o.p. quoted 1s. 8d. per gallon, less 2½% delivered.

POTASSIUM BICHROMATE.—Quoted 4¼d. per lb., delivered U.K. or c.i.f. Irish ports, with an allowance for contracts.

POTASSIUM CARBONATE.—Spot material on offer, £25 10s. per ton ex store. Offered from the Continent at £24 15s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99¾/100% POWDER.—Quoted £29 per ton ex store; crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £20 17s. 6d. per ton, c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton ex store.

POTASSIUM PERMANGANATE B.P. CRYSTALS.—Quoted 5¼d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Spot material quoted 7d. per lb. ex store. Offered for prompt delivery from the Continent at about 6¾d. per lb. ex wharf.

SODA CAUSTIC.—Powdered 98/99%, £17 10s. per ton in drums, £18 15s. in casks. Solid 76/77% £14 10s. per ton in drums, £14 12s. 6d. per ton for 70/72% in drums, all carriage paid buyer's station, minimum four-ton lots. For contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3½d. per lb., delivered buyer's premises, with concession for contracts.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station; powdered or pea quality, 7s. 6d. per ton extra. Light soda ash, £7 13s. per ton, ex quay, minimum four-ton lots, with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £9 2s. 6d. per ton, ex station, minimum four-ton lots. Pea crystals on offer at £15 per ton, ex station, minimum four-ton lots.

SODIUM NITRATE.—Chilean producers now offer at £10 per ton, carriage paid, buyer's sidings, minimum six-ton lots.

SODIUM PRUSSIATE.—Quoted 5¼d. per lb., ex store. On offer at 5d. per lb., ex wharf, to come forward.

SODIUM SULPHATE (SALTCAKE).—Price, 60s. per ton, ex works; 65s. per ton, delivered, for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption: solid 61/62%, £10 per ton; broken, 60/62%, £11 per ton; crystals 30/32%, £8 2s. 6d. per ton, delivered buyers' works on contract, minimum four-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £9 5s. per ton; ground American, £8 15s. per ton, ex store.

ZINC CHLORIDE 98%.—British material now offered at round about £19 per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £11 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

United States Paint Research

RESEARCH on a wide scale to improve the finish and durability of protective coatings is being developed by the Paint and Varnish Division of the American Chemical Society. Despite the importance of this industry in preserving wood surfaces both inside and outside, chemical advances have, it is declared, not kept pace with other changes in the industry during the past decade. Paint and varnish producers, raw material manufacturers, and university chemical laboratories, are responding to a plea to co-operate in solving problems which "touch every angle of paints, varnishes, enamels, waxes, and cellulose ester or resin lacquers."

A preliminary survey of laboratories available and experiments now in progress has been made by a joint committee composed of representatives of the Paint and Varnish Division of the American Chemical Society, the American Society for Testing Materials, the Federation of Paint and Varnish Production Clubs, and the Scientific Section of the American Paint and Varnish Manufacturers' Association. The manufacturer in this industry to-day who operates without adequate chemical research soon finds his process obsolete, it is stated, or his product displaced by more modern chemical contributions of greater value to the consumer. Among the subjects to be investigated are new analytical and testing methods, factors in corrosion, protective films, and surface tension.

Bromine in Germany

THE production of bromine in Germany increased from 1,800 metric tons in 1929 to about 2,800 tons in 1930. This increase was influenced by developments in the production of ethylene dibromide at two new plants, the Brennerei and Presshefefabrik Tornesch, at Tornesch, and the Kruegershall potash plant, near Halle. It appears that these two plants took over 1,000 metric tons of bromine from the bromine syndicate in 1930 for making ethylene dibromide, practically all of which is said to have been exported to the United States. The Tornesch plant gets its ethylene from alcohol which is made from wood waste.

Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, April 9, 1931.

Business in chemical products on the Manchester market opened out very quietly just after the holidays, but at the time of writing operations generally are about back to where they were just prior to the stoppage. Prospects of some degree of seasonal improvement in the demand are not wanting, and apart from this, the fact that textile dyeing and finishing works are somewhat better placed in consequence of the slight recovery in cotton and woollen mills, tends towards a free movement of certain classes of chemicals. On the whole, the recent steadiness of prices continues.

Heavy Chemicals

Current offers of dibasic phosphate of soda range from £10 to £10 10s. per ton, business during the past day or two having been on quiet lines. Bicarbonate of soda meets with a fair volume of inquiry and values are well held on a contract basis of £10 10s. per ton. The demand for prussiate of soda has been only on a comparatively moderate scale, but prices are firm at from 4¾d. to 5¼d. per lb., according to quantity. Chlorate of soda is moving off rather quietly, with values at from £26 10s. to £27 per ton. Bichromate of soda keeps steady at 3¾d. per lb., less 1 to 2½ per cent. discount according to quantity, buying interest in this material being on moderate lines. There is a fair movement of caustic soda, principally against old contracts, which are quoted on the basis of £12 15s. to £14 per ton, according to quality. Hyposulphite of soda is fairly steady, although the demand this week has been on the quiet side; the commercial product is quoted at round £9 per ton and the photographic at from £15 to £15 10s. There has been practically no change in the price position of sulphide of sodium since last report, the 60-65 per cent. concentrated solid material offering at about £9 10s. per ton and the commercial grade at £8. Alkali meets with a quietly steady inquiry and values are firm at round £6 per ton. Saltcake is in moderate request, with prices well held at from £2 15s. per ton upwards.

Among the potash materials, a quiet trade is going through in the case of chlorate, quotations for which are held at about £27 10s. per ton. Only a moderate amount of business is being placed in permanganate of potash, but prices are steady at round 5½d. per lb. for the B.P. grade and 5¾d. for the commercial quality. Bichromate of potash shows no quotable change, and at 4¼d. per lb., less 1 to 2½ per cent., buying interest is on a moderate scale. Offers of carbonate of potash this week have been at round £25 per ton, with caustic still on offer at about £28 10s. Yellow prussiate of potash is attracting some attention and quotations are firm at from 6¾d. to 7¼d. per lb., according to quantity.

Transactions in the case of sulphate of copper tend to be restricted to near delivery parcels, with quotations not too strong at £20 per ton, f.o.b. Arsenic is only in quiet request, with offers at about £19 per ton at the mines, or a shade below this figure, for white powdered, Cornish makes. The demand for the lead products tends to drag, with nitrate quoted at about £29 per ton and white and brown acetate at £33 and £32. The acetates of lime continue in limited request, but at about £7 5s. per ton for the brown material and £13 for the grey there has been little further change in prices.

Acids and Tar Products

There is a moderate inquiry about for oxalic acid, values of which are well held at £1 12s. per cwt., ex store. Acetic acid is attracting a fair amount of attention at firm prices, the technical glacial quality being on offer at round £51 per ton and the 80 per cent. commercial at about £37. Tartaric acid is in quiet demand at a top figure of 11½d. per lb., with citric acid coming in for only moderate enquiry at round 1s. 0½d. per lb.

Export buying interest in pitch has pretty well died off and values are largely nominal at about 37s. 6d. per ton, f.o.b. Creosote oil is in quiet demand, with prices about maintained at from 3¼d. to 4¼d. per gallon, naked, according to quality. Crude carbolic acid is quoted at round 1s. 2d. per gallon, naked, with crystals in fair demand at from 5¼d. to 5½d. per lb., f.o.b. Solvent naphtha is about maintained at 1s. 2d. per gallon, naked, at works.

Company News

Tarapaca and Tocopilla Nitrate Co.—The annual meeting will be held at the Chile office, Calle Anibal Pinto 595, Iquique, on June 8, at 4 p.m.

Joseph Crosfield and Sons, Ltd.—The profit for the period of thirteen months from December 1, 1929, to December 31, 1930, was £598,458. Adding balance brought forward of £24,924, there is a total of £623,383. It is proposed to pay a dividend on the ordinary shares at the rate of 15 per cent., place £100,000 to general reserve, and carry forward £51,793.

Associated Dyers and Cleaners, Ltd.—The accounts for 1930 show a drop in trading profits of £29,424 to £57,159. The reserve allocation of £3,001 compares with £10,000 in 1929, while contingencies reserve receives £5,000, against a similar sum transferred to special depreciation reserve in 1929. The ordinary dividend is lowered to 3½ per cent., making, with the interim, 6 per cent. for the year, against 10 per cent. and a bonus of 2½ per cent. in 1929.

Bede Metal and Chemical Co.—The operations for 1930 resulted in a profit, after writing off depreciation at Hebburn, £4,025, and in Norway £4,426, and after making sufficient provision for tax, of £22,008, to which is added the amount brought forward, £6,439, making £28,447. The directors recommend a final dividend of 1s. per share (less tax), making 1s. 6d. per share for the year; to reserve fund, £8,000, making it £30,000; leaving to be carried forward, £7,362.

Indestructible Paint and Standard Varnish Co.—For the year 1930 the report states that the net profits for the twelve months amounted to £34,053, which, with the balance brought forward, £4,190, makes £38,243. The directors recommend transferring to reserve for income tax £2,500; to depreciation reserve, £2,500; to reserve account, £3,740; reserving for three months unpaid dividend on 7 per cent. cumulative preference shares, £1,050; declaring final dividend of 5 per cent. and bonus of 5 per cent. on ordinary shares; leaving to be carried forward, £3,843.

Amalgamated Zinc (de Bavay's).—The income for the half-year to December 31 last was £11,556, against £9,904 in previous half-year, consisting of £6,550 interest earned and £5,006 dividends received. After deducting expenses, net profit was £7,372, which, added to £896 brought in, made £8,268, which has been carried forward in appropriation account. Since close of period, dividend No. 48 of 4 per cent., absorbing £8,000 (same) has been declared, payable on April 10. Liquid assets show surplus over liabilities of £218,628, not including amount paid on shares in other companies.

William Gossage and Sons, Ltd.—The report for the thirteen months ended December 31, 1930, states that, after providing for depreciation, repairs, etc., the net profit amounts to £267,550, to which is added balance brought forward, £32,888, making £300,438, which has been appropriated as follows: Dividend on 5 per cent. first cumulative preference shares to December 31, 1930, £24,375; dividend on 6½ per cent. cumulative preference shares to December 31, 1930, £52,813; to general reserve, £50,000; interim and final dividends on ordinary shares, viz., 20 per cent., £140,000; carrying forward, £33,250.

Sulphur Production in United States

With a production of 2,558,981 long tons, sulphur output in the United States reached new high levels in 1930, according to the United States Bureau of Mines. This is an increase of 8 per cent. over the output of 2,362,389 tons in 1929, the former record year. Shipments decreased, however, from 2,437,238 tons, valued at approximately $43,800,000, in 1929, to 1,989,917 tons, valued at $35,800,000 in 1930, a decline of 18 per cent. in both quantity and value. The large decrease in shipments is due principally to a decrease in exports from 855,183 tons in 1929 to 593,312 tons in 1930, a drop of 31 per cent. The high rate of production in 1930, accompanied by declining domestic shipments and exports, resulted in an increase in producers' stocks from 1,928,000 tons on January 1 to 2,497,000 tons at the end of December—a net increase of 569,000 tons.

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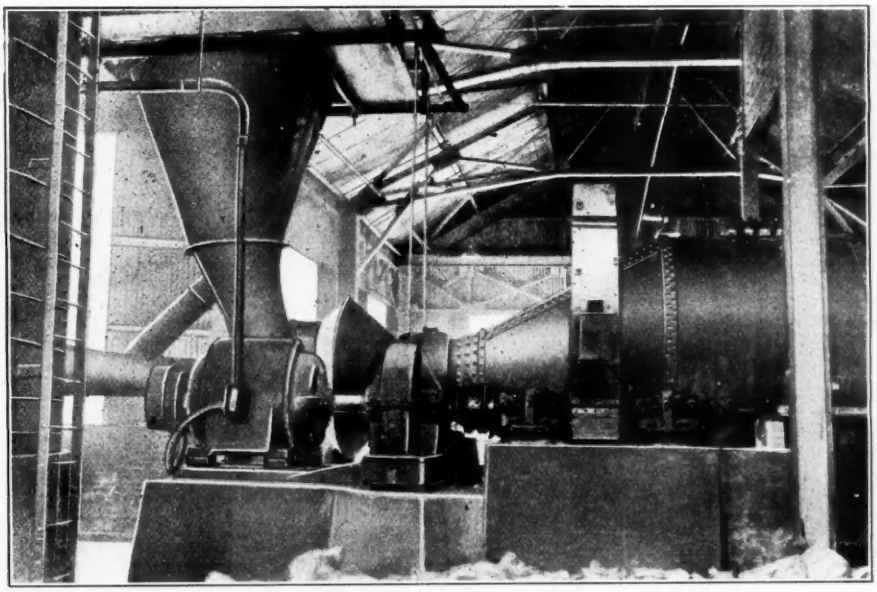

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New Chemical Trade Marks

Applications for Registration

These lists are specially compiled for us from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to May 1, 1931.

CLOPHEN.

520,592. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. I.G. Farbenindustrie Aktien-Gesellschaft (a joint stock company organised under the laws of Germany), Mainzerlandstrasse 28, Frankfort-on-Main, Germany; manufacturers. February 23, 1931.

CLOPHEN.

520,593. Class 4. Raw, or partly prepared, vegetable, animal, and mineral substances used in manufactures. I.G. Farbenindustrie Aktiengesellschaft (a joint stock company organised under the laws of Germany), Mainzerlandstrasse, 28, Frankfort-on-Main, Germany; manufacturers; February 23, 1931.

KORBIN.

520,853. Class 4. Raw, or partly prepared, vegetable, animal, and mineral substances used in manufactures. British Dyestuffs Corporation, Ltd., Hexagon House, Blackley, Manchester; manufacturers. March 4, 1931.

Chemical Trade Inquiries

These inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

ITALY.—A firm in Trieste is desirous of obtaining the representation of British exporters of shellacs, gums and chemicals. (Ref. No. 282.)

BELGIUM.—A firm of agents at Antwerp is desirous of obtaining the representation of British manufacturers of industrial chemicals. (Ref. No. 276.)

FINLAND.—The Finnish State Railway Administration is inviting tenders, to be presented in Helsingfors by April 15, for the supply of approximately 900 tons of creosote oil for impregnating purposes. Firms desirous of offering creosote of United Kingdom manufacture can obtain further particulars upon application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Ref. No. F.X. 1,087.)

British Trade with Warsaw

THE Department of Overseas Trade announce that Mr. R. E. Kimens, the Commercial Secretary to H.M. Embassy at Warsaw, will be in London shortly on an official visit. Mr. Kimens will be available at the offices of the Department during the period April 21 to May 1 to interview manufacturers and merchants interested in the export of British goods to Poland. He will also visit a few of the more important industrial centres in the Provinces. Firms desiring interviews with Mr. Kimens in London, or information regarding his arrangements to visit provincial centres, should apply to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, London, S.W.1, quoting reference No. 25656/31.

Japanese Markets for Hydrosulphite

THERE are only four firms in Japan producing hydrosulphite, and of these only two are estimated to have a monthly production exceeding 100 metric tons. The remainder of the reducing agents used in Japan are imported from Germany, the chief import being "rongalite," which is competitive with hydrosulphite. In 1928, the total Japanese imports of hydrosulphite and similar reducing agents were 1,260 tons; in 1929, this figure had risen to 1,600 tons.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

CELLUTINE, LTD., London, W.C., manufacturers of jernoid, etc. (M., 11/4/31.) Registered March 17, £700 debenture, to D. Schilperoort, 75, Devonshire Road, Tooting; general charge. *£100. December 27, 1929.

RAYON MANUFACTURING CO. (1927), LTD., Leatherhead. (M., 11/4/31.) Registered March 17, transfer of debenture for £104,000 (not ex.), to Westminster Bank, Ltd.; charged on property at Ashtead, also general charge. *£147,290. January 14, 1931.

Satisfactions

HAMMOND (W. G.) AND CO., LTD., Boston, manufacturers of chemical manure, etc. (M.S., 11/4/31.) Satisfaction registered March 19, all moneys, etc., registered October 11, 1918.

SQUIRE (J. H.), LTD., Manchester, manufacturing chemists. (M.S., 11/4/31.) Satisfaction registered March 18, £300, registered November 15, 1926.

London Gazette, &c.

Company Winding Up Voluntarily

ASSOCIATED BRICK, CEMENT AND LIME MERCHANTS, LTD. (C.W.U.V., 11/4/31.) By special resolution March 30. Percival Foddering, of Finsbury Court, Finsbury Pavement, London, E.C.2, appointed liquidator of the company.

Companies Winding Up

LEWIS JAMESON AND CO., LTD. (C.W.U., 11/4/31.) R. H. Porter, of Austin Friars House, Austin Friars, London, E.C.2, appointed liquidator of the company.

STEYNING LIME AND BRICK CO., LTD. (C.W.U., 11/4/31.) L. S. Snell (with a committee of inspection), of 8–11, Pavilion Buildings, Brighton, appointed liquidator of the company.

New Companies Registered

EDMONDSON AND VOGT, LTD. Registered March 31. Nominal capital, £1,200 in £1 shares. Consulting, analytical, pharmaceutical and general chemists, herbalists, etc. Directors: H. G. Wilson, Lynn Garth, Kendal; H. F. Alsop.

GLASGOW METHYLATING CO., LTD., 10, Elliot Street, Glasgow, C.3. Registered April 4 in Edinburgh. Nominal capital, £500 in £1 shares, Manufacturers of industrial, mineralised and power methylated spirits, etc. Directors: R. S. S. Brown, P. Murray.

New Pastel Colours in Plastics

THE THIRTEENTH EXPOSITION of Chemical Industries will be held in New York from May 4 to 9. As in previous years, there will be many examples of moulding plastics and other synthetic resins on view, including new pastel colours. Two years back the production of pastel colours was doubted by manufacturers of phenolic compounds, but pink, blue, green, yellow, old ivory and grey are now available. These materials are capable of being moulded under conditions identical with those for moulding standard compounds, and their water absorption is claimed to be less than that of the older phenolic products.

United States Market for Ethylene Dibromide

INCOMING shipments of ethylene dibromide into the United States were 2,934,200 lb. in 1930, or between six and seven times the 1929 imports, which totalled 443,000 lb. The value of the 1930 imports amounted to $629,360; those of 1929, $104,920.